

A RECORD OF
FORTY-THREE YEARS' SERVICE
AS
SOLDIER, POLITICAL OFFICER AND ADMINISTRATOR

BY
THOMAS HENRY THORNTON, C.S.I., D.C.L.

SOMETIME FOREIGN SECRETARY TO THE GOVERNMENT OF INDIA
AUTHOR OF "THE LIFE AND WORK OF COLONEL
SIR ROBERT SANDEMAN"

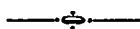
WITH PORTRAIT, MAP AND ILLUSTRATIONS

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INTRODUCTORY.



THE Indian career of the late GENERAL SIR RICHARD MEADE, K.C.S.I., C.I.E., who died at Hyères in March, 1894, though little known in England, has some claim to be remembered.

For it was the career of one who, besides performing valuable military services, conducted, for upwards of twenty years, the relations of the British Government with some of the principal Native States of India, and, as confidential adviser and Agent to seven successive Viceroys, played a more or less important part in influencing and carrying out their policy.

And it was a career in some respects unique. Born in 1821, Meade proceeded to India so long ago as 1838. For nearly twenty years he passed an uneventful life as regimental or staff officer in the Bengal Army, without a chance of military distinction. His social qualities made him a general favourite, and he was recognised as a very promising officer, but there was little scope for his abilities, and none could have predicted that the genial infantry captain of those days was to become

known to fame as a dashing leader of cavalry, and as having filled with credit four of the highest political appointments under the Crown in India.

But so it was. On the outbreak of the great Mutiny of 1857, he held the office of Brigade-Major of the Gwalior Contingent—a force maintained at the expense of SINDHIA, the Marátha chief, but officered by Englishmen and composed largely of sepoy from Hindústán. The force mutinied; several officers and other Europeans—men, women and children—were shot down, and Captain Meade and his young wife, the present LADY MEADE (whose calmness and courage during these trying times were specially noticed by the Government of India), with difficulty escaped to Agra.

At Agra he took part in the engagements with the mutineers, and raised a regiment of cavalry, which, under the name of “Meade’s Horse,” did admirable service for four years.

In June, 1858, when Sindhia’s own army deserted to the rebels, and Sindhia himself fled for his life to Agra, Meade was selected to escort him to the camp of SIR HUGH ROSE (afterwards LORD STRATHNAIRN), who, after a brilliant campaign in Central India, had marched from Kálpí to recapture Gwalior and ~~reinstall the Ma-~~hárája in his capital.

By dint of a forced march of sixty-five miles in twenty-four hours Meade reached the General’s headquarters at Morár (the old cantonment of the Con-

tingent) on the morning of the 18th June. Leaving the Mahárája in camp he accompanied Sir Hugh Rose as A.D.C. during the action on the following day, and, after the defeat of the enemy, conducted the British troops through the narrow streets of the town to the palace, still in possession of the rebels.

At great personal risk he entered the palace, full at the time of armed and excited soldiery, parleyed with the occupants and induced them to surrender without firing a shot; thus saving many lives and much destruction of property, and winning the lasting gratitude of the Marátha Chief.

After the recapture of Gwalior he was employed on a commission for trying and punishing the rebel soldiers, then scoured the country with his cavalry and, thanks to his influence with local chiefs, accurate intelligence and rapid movement, had the good fortune to capture and bring to justice the rebel leader TANTIA TOPI—believed to have been one of the NÁNA'S chief agents in perpetrating the Cawnpore massacres.

His firmness, tact and justice in dealing with the chiefs and people with whom he was brought in contact attracted the notice of the Governor-General, LORD CANNING, who appointed him in 1859, first temporarily then permanently, POLITICAL AGENT AT GWALIOR.

Two years afterwards he was advanced to the post of GOVERNOR-GENERAL'S AGENT FOR THE STATES OF CENTRAL INDIA; a most important charge, including,

besides the great Marátha States of Gwalior and Indore and their subordinate chiefs, the Áfghán principality of Bhopál (next to Hyderabad the most powerful Mussulman State in India) and the Rájput States in Bundelkhand and Rewah—all in a condition more or less disturbed, and some of them but recently the seat of war.

Here he completely re-established the *pax Britannica*, and maintained it successfully for eight years, without once calling out the regular troops; settled numberless disputes and several political questions of great delicacy; opened up the country with new roads; established rest-houses and dispensaries; laid the foundations of forest conservancy; advanced education and administrative reforms; working, at the same time, with judgment and caution; taking care to have the Chiefs with him in all he did and enjoining the same course on his subordinates.

For his success he was decorated with the C.S.I., on the recommendation of SIR JOHN LAWRENCE, and it led to his being selected by LORD MAYO, in 1870, to succeed Mr. LEWIN BOWRING in the CHIEF COMMISSIONERSHIP of MYSORE, as an officer specially qualified to prepare the province for restoration to native rule.

In 1873, while closely engaged in the work entrusted to him, he was appointed by LORD NORTHBROOK President of a Commission to inquire into serious charges of maladministration made against MALHAR

RAO, Gaekwar of Baroda—the first in rank, if not in power, of all the Marátha Ruling Chiefs; and in 1875 took part in the Chief's trial for an alleged attempt to poison COLONEL PHAYRE, the British Resident.

After the conclusion of the trial, but before the decision was announced, he was appointed to succeed SIR LEWIS PELLY (whose health had broken down) as SPECIAL COMMISSIONER FOR THE AFFAIRS OF BARODA.

In this capacity he carried out the sentence of deposition passed against Malhar Rao, put down a rising at Baroda in his favour, took part in selecting his successor, and reorganised the administration on principles which have been followed ever since, to the great benefit of all classes in the State.

In recognition of his services on the first Baroda Commission he was created K.C.S.I.; his services as Special Commissioner were publicly acknowledged in the *Gazette*, and, in November, 1875, he was selected by Lord Northbrook for the office of RESIDENT AT HYDERABAD—the blue ribbon of the political service and then regarded as the “most important and difficult position in India”.

Here for five years he ably represented the British Government during a critical period.

While firmly maintaining, as in duty bound, the supremacy of the Suzerain Power, and withstanding the assumption of uncontrolled authority by the late Chief's minister, he strenuously upheld the interests of

the Hyderabad State and of its Ruler (then a minor), for whom he persisted in securing the benefit of a proper education.

Surrounded by intrigue on every side he identified himself with no party in the State, but earned the respect and esteem even of those whose policy and projects it was his duty to oppose.

During the excitement of the Afghán war he aided SIR SÁLÁR JANG in maintaining order in the Nizám's territories, and heartily seconded his efforts in effecting administrative reforms; and, at length, all serious difficulties in Hyderabad being over, and the administration of the Berár districts well in hand, he was able to retire from the service with the satisfaction of feeling that he had fully accomplished the work he was specially appointed to perform.

Accordingly, in March, 1881 (at the close of an extended term of office), he returned to England, after forty-three years of Indian service, during which he paid only one brief visit to his native country.

After retirement Sir Richard Meade was the subject of a series of malignant newspaper attacks; but, for reasons of State, he was debarred from either prosecuting his assailant or publishing the despatches in which his conduct was completely vindicated. Extracts from those despatches are now published for the first time, not indeed for the vindication of his memory (no such vindication is required), but for the satisfaction of his family.

The libels are forgotten, and throughout the States of Central and Southern India—territories as populous as Italy and little less extensive than the German Empire—the memory of RICHARD MEADE is still held in reverence and affectionate regard as a firm and friendly representative of the protecting Power and the impersonation of justice, courtesy and honour.

* * * * *

Such is a brief sketch of the career and services which it is the object of the following pages more fully to describe.

The task, besides being most congenial, has been rendered comparatively easy by the never-failing help of one whose name the writer hopes to be forgiven for mentioning—Sir Richard's eldest daughter, Mrs. W. H. CAINE, whose careful cataloguing, indexing and analysis of her late father's voluminous papers would do credit to a highly trained official. And MAJOR (now LIEUTENANT-COLONEL) MALCOLM MEADE, the eldest son, at present British Resident at Bushire, furnished an excellent sketch of his father's career, which has formed the basis of the present narrative.

The chief difficulty has lain, not in want of well-arranged material, but in the confidential character of the work in which the subject of the memoir was engaged. Much that is deeply interesting, much that is important, much that is due to the memory of the deceased has had, perforce, to be omitted, but sufficient

remains to show (it is hoped) how much England and her great Dependency are indebted to the energy, courage and wisdom of the late *doyen* of the political service of India.

The writer has also to acknowledge the valuable assistance he has received from—

SIR LEPEL HENRY GRIFFIN, K.C.S.I. (late Agent to the Governor-General for the States of Central India).

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for having kindly placed important letters at his disposal; and to SIR WILLIAM HUNTER, K.C.S.I., for the map of India attached.

In the spelling of Oriental names the system em-

employed in the *Imperial Gazetteer of India* has been generally followed. Under that system the vowels are ordinarily sounded as in Italian, and the consonants transliterated from the Úrdú by fixed equivalents; but an exception is made in the case of names of places of which the spelling is fixed by usage. Thus *Cawnpore* is written, not *Káhnpiúr*; *Mysore*, not *Maisiúr*; *Meerut*, not *Mírath*. In one case the *Gazetteer* spelling has not been followed. The name of the Nizám's capital is written *Hyderabad*, not *Haidarábád*. The latter is, of course, more accurate, but the former is the spelling officially employed by the Calcutta Foreign Office, and has the sanction of long usage.

CONTENTS.



CHAPTER I.

| | PAGE |
|--|------|
| BIRTH, PARENTAGE AND EARLY YEARS | I |

Birth and parentage—Account of the Meade family—Their attitude in the Irish rebellions of 1568-1601—Execution of Patrick Meed—Conduct in the Civil War—Meade's father and mother—Innishannon and its surroundings—Meade's education and early life—Appointed cadet in the East India Company's service.

CHAPTER II.

| | |
|-------------------------------------|---|
| INDIA—FIRST NINETEEN YEARS. | 9 |
|-------------------------------------|---|

Proceeds to Arracan—After holding various temporary appointments joins the Gwalior Contingent in 1845—Origin and history of Contingents explained—Advancement in the service—Marriage in 1853—Proceeds to Burmah and serves for a year as Assistant Adjutant-General of the Pegu Division—Returns to Gwalior, 1855, until the outbreak of the Mutiny of 1857.

CHAPTER III.

| | |
|-------------------|----|
| GWALIOR | 16 |
|-------------------|----|

Account of Gwalior—Its extent, population and political condition in 1857—Sindhia—His antecedents—Invested with full powers of sovereignty in 1852—Appoints as his Minister Dinkar Rao—Dinkar Rao's reforms—Major Malcolm, the political agent, transferred to another appointment—Dinkar Rao dismissed from office, and affairs fall into confusion—Is reinstated on the representation of Major Malcolm's successor, Major Charters Macpherson—Visit of Sindhia to Lord Canning in 1857—Its effect—Description of the town, fortress and cantonments of Gwalior.

CHAPTER IV.

THE MUTINY AT GWALIOR

Effects of outbreak at Meerut—Attitude of the Brigadier—Action of Political Agent—Loyal conduct of Sindhia—Ladies and children sent to the Residency and then to the palace for protection—Proceeding disapproved of by the Brigadier—Mrs. Meade and her sister return to cantonments and are followed next day by the other ladies—Action of Brigadier approved by Government of India, and Mrs. Meade and Mrs. Murray's conduct officially eulogised—Anxiety—Outbreak on the 14th June—Conduct of sepoys—Mrs. Murray's narrative of the escape of Captain Meade and those with him from cantonments to the Phulbágh Palace—Political Agent and fugitives leave for Agra on following morning—Sindhia promises to do his best to detain the mutineers at Gwalior—Perils of the journey—Difficulties at the river Chambal—A band of fanatics—Baldco Singh, a Brahman chief, comes to the rescue and passes them over the river into the Dholpur State—Loyal conduct of its chief—The party reach Agra on the 17th—Rewards to Baldco Singh and the Rána.

CHAPTER V.

EVENTS AT AGRA AND GWALIOR

Situation at Agra—Advance of the rebel force from Nimach and Nasrábád—Defection of the troops of friendly States—Disastrous fight at Sassiah—Part taken by Meade—Rising at Agra—Fall of Delhi—Greathed's column—Advance of rebels from Mhau and Indore—Greathed's column reaches Agra—Attacked by rebels—Rebels defeated with loss—Meade raises a regiment of native cavalry—Its services—Rebel forces driven from Kálpi approach Gwalior—Sindhia attacks them—His troops join the enemy—Sindhia flies to Agra—Gwalior occupied by rebels.

CHAPTER VI.

THE RECAPTURE OF GWALIOR 4

Sir H. Rose moves from Kálpi on 5th June—His force—Morár occupied—Advance of Smith's brigade from Sipri—Sweeps the hills and captures the Phulbágh batteries, but has to retire—Death of the Ráni of Jhánsi—Sindhia summoned to the camp—Meade appointed to escort him—Reaches Morár on the 18th—Sir H. Rose decides to join his force with Smith's and takes Meade with him—Fighting on the 19th; Meade having reconnoitred enemy's position, Sir H. Rose storms the heights—Enemy driven off and all its guns (26) captured, and rebel

force in the plain driven into the Lashkar—General decides to advance at once through the Lashkar to the palace—Meade acts as guide, and, on arrival at the palace, enters the courtyard alone and induces the holders to surrender without bloodshed—On the 20th Sindhia received by Sir H. Rose at the head of his troops, and conducted to his palace—Meade leaves to join the pursuing column—Just too late for the victory of the 21st—No mention of Meade's special service in procuring surrender of the palace contained in Sir H. Rose's despatch—Meade vainly attempts to get the omission rectified—Remarkable speech by Sindhia.

CHAPTER VII.

RESTORATION OF ORDER IN GWALIOR—SURRENDER OF MÁN SINGH
—CAPTURE AND EXECUTION OF TANTIA TOPI 63

State of Gwalior—Measures taken to restore order—Major Meade appointed on a commission to inquire into the conduct of the troops—Carries it out with justice and efficiency and earns the thanks of the Government of India and Secretary of State—Brigadier-General Napier takes in hand the disaffected portion of Gwalior territory, where Rájá Mán Singh had influence—Mán Singh seizes the fort of Pauri, which is promptly attacked and taken by Napier, but Mán Singh escapes and is joined by Tantia Topi—Meade, having completed his inquiry, joins Napier's force, and is placed in command of a detachment—Captures and executes Tantia Topi—Statement by the latter before trial—His conduct and bearing after sentence—Tantia's prompt execution has a most salutary effect—Congratulations by Sir R. Hamilton, General Napier, Sir Hugh Rose and the Government of India—Verses in honour of the occasion by an English sergeant—Meade successfully attacks and disperses a rebel gathering at Garroya, thus ending the campaign in this part of India, and receives the thanks of Government.

CHAPTER VIII.

WORK AS POLITICAL AGENT AT GWALIOR 85

Meade appointed acting Agent—Letter from Lord Canning—Meade rapidly acquires influence over Sindhia—Secret of his success—Interview with Lord Canning at Agra in 1859—Is thanked for his services, and in 1860 confirmed in his appointment—Handsome testimony from Lord Canning, by whom he is frequently consulted—Negotiates the treaty of 1860 with Sindhia, and on the death of Sir R. Shakespear is offered and accepts the important post of Resident at Indore and Governor-General's Agent for Central India.

CHAPTER IX.

| | PAGE |
|--|------|
| WORK AS GOVERNOR-GENERAL'S AGENT FOR CENTRAL INDIA | 93 |

Description of Central India—Its political importance—The great Maráthia States—Bhopál—The “mediatised” chiefs—Contingents—The States in Bundelkhand and Baghelkhand—Conflicting interests—Differences settled, and the peace maintained by the Governor-General's Agent and seven subordinate Political Agents—The British Force in Central India—The local corps—The residency at Indore and its surroundings—Improvements effected by Meade and his successors—General condition of the States of the Agency at the time of Meade's appointment in respect to police, administration of justice, military forces, education, public works, roads, jail buildings, forest conservancy—Gwalior and its ruler—Questions to be dealt with—Indore and Holkar—Bhopál—The minor States of Málwa—Mánpur—The States of Bundelkhand and Rewah—Important political and administrative work devolving on the Governor-General's Agent.

CHAPTER X.

| | |
|---|-----|
| WORK AS GOVERNOR-GENERAL'S AGENT FOR CENTRAL INDIA (<i>cont.</i>) | 114 |
|---|-----|

Question of the restoration of the Gwalior fortress—How settled—Reduction and distribution of Sindhia's troops—Correspondence with Sir John Lawrence—Meade's successful action highly approved of—Attempts to effect a reconciliation between Sindhia and Dinkar Rao—Their partial success—Sindhia's friendly feeling to Meade—Difficulties with Holkar—The “shoe question”—His aggressive conduct in reference to the Bhils—Impracticability in the case of boundary questions—Nevertheless continues to be on the best terms with Meade—Speech at a banquet in 1880—Administrative progress of the States of the Agency during the period of Meade's term of office—Meade's general policy—Roads and public works—Police—Administration of justice—Revenue system—Transit duties—States under British management—Ratlám—Barwáni—Their condition contrasted with Sailána, which had been restored to the chief's rule—Meade's testimony to the comparative benefits of British and native rule—Remarks of the Government of India on Meade's Administration Report—Results of Meade's work in Central India summed up.

CHAPTER XI.

| | |
|--|-----|
| WORK AS CHIEF COMMISSIONER OF MYSORE AND COORG | 135 |
|--|-----|

Meade takes furlough—On return is offered and accepts the Chief Commissionership of Mysore and Coorg—Account of Mysore—Its physical features, population, climate, products, revenue, history—Administra-

tion assumed by the British Government in 1831—Entrusted to General Cubbon, who conducts it for twenty-five years—Financially successful, but becomes in time inadequate—Mr. Bowring succeeds and reorganises the province—Great improvements effected—The Chief petitions for reinstatement—His prayer four times rejected—But policy changed in 1857 and a promise given that the Government would be made over to his adopted son on coming of age—Administrative arrangements have therefore to be reconsidered—Discussions—Qualifications required in the *ad interim* administrator—Letters from Lord Mayo and Sir H. Durand—Coorg—The new appointment a great change for Meade—He adapts himself to the situation and throws himself heartily into the work—His report for 1872-3 quoted—The young Mahārāja—His education—Succession in 1881 and early death—His correspondence with Meade—Meade's life as Chief Commissioner of Mysore—Appointed on special duty.

APPENDIX TO CHAPTER XI. Letters from the late Chief of Mysore

153

CHAPTER XII.

BARODA (First Commission)

155

Meade appointed president of a commission to inquire into the affairs of Baroda—Account of Baroda—Its territories, population, capital, reigning family and history—Loyalty of Khandi Rao in 1857, but falling off in his administration during the last six years of his reign—His death in 1870—Succeeded by Malhar Rao—His maladministration—Colonel Phayre becomes Resident in 1873 and brings to notice the grievously oppressive character of the Gaekwar's administration and neglect to fulfil his treaty obligations—Members of the committee—Their instructions—The inquiry—Report submitted in March, 1874—Its findings and proposals—Meade's conduct of the inquiry greatly approved of—Letter from Colonel Etheridge—Meade created K.C.S.I.—Orders of the Government of India on the report—The Gaekwar allowed eighteen months in which to carry out necessary reforms.

CHAPTER XIII.

TRIAL OF THE GAEKWAR

171

The Gaekwar commences his term of probation badly—Mr. Dadabhai Naoroji—Proceedings of Colonel Phayre—His recall asked for—He is superseded by Sir L. Pelly—Serious state of affairs—Mr. Dadabhai

Naoroji resigns—Sir L. Pelly recommends deposition of the Gaekwar—Inquiries into the poisoning case—Confessions of Rājōi and Nārāsī—Government determines to temporarily depose Malhar Rao and proceed with the criminal inquiry—Proclamation—Gaekwar dethroned and placed under honourable surveillance in a house in British cantonments—Excitement amongst the Marāthas of Western India—Further development of the case—Damodur, private secretary to the Gaekwar, confesses—Government of India forms a special tribunal—Its composition—Lord Northbrook's minute—Meade appointed one of the judges, and Sindhia, Jeypore and Sir Dinkar Rao agree to serve—Notification of trial—Comments of the *Times*—Baroda trial an important event in the political history of India—Form of inquiry, why adopted—Association of chiefs in the inquiry a measure of doubtful expediency; but the idea a noble one.

CHAPTER XIV.

TRIAL OF THE GAEKWAR (*continued*) 190

The so-called trial—Opening scene described by Serjeant Ballantine—Account of the proceedings—Brief abstract of the evidence—Serjeant Ballantine's defence—Mr. Scoble's reply—Serjeant Ballantine's testimony to the fairness of the inquiry—His conduct of the defence—Comments on the evidence made by the press before decision—Native opinion—The Commissioners, not being able to agree, submit separate reports—English members of the Commission find all the charges proved—Two, Sindhia and Dinkar Rao, find the principal charge not proven; one, Jeypore, finds the accused not guilty—Meanwhile Meade succeeds Sir L. Pelly, who leaves on account of ill-health—The Government of India supports the view of the English Commissioners and recommends Gaekwar's deposition on the ground of his guilt and also on the ground of misgovernment—The Home Government sanctions his deposition on ground of misgovernment, but leaves out of view the report of the Commission—Before the decision is generally known Meade quietly deports the Gaekwar to Madras—Proclamation of Gaekwar's deposition quietly received in Baroda, but announcement unfavourably received in England and India until publication of Baroda Blue Book, when all opposition ceases—General result of proceedings.

CHAPTER XVII.

| | PAGE |
|--|------|
| HYDERABAD (<i>continued</i>) | 255 |

Aurangzeb arranges for the administration of the Deccan—Chin Kalich Khan (Ásaf Jáh) appointed Viceroy—In the reign of Farokhsir heads a movement against the Sayyads and liberates the Emperor from their domination—Ásaf Jáh Minister at Dehli—Resigns and proceeds to Hyderabad—Defeats the Mughal Governor and becomes Nizám of the Deccan—Tries to protect the Emperor from the Maráthas, but is disastrously defeated at Bhopál—Joins his forces with the Emperor's in endeavouring to resist Nádir Shah's advance—Death of Ásaf Jáh in 1748—Struggle for succession—French and English take sides in the dispute—By treaty with the English in 1759 French are excluded from Hyderabad—Series of treaties providing for the protection of Hyderabad by a British force in return for territorial cessions, etc.—A Resident appointed in 1788—Further cessions—Allotments of territory made to the Nizám on four occasions—Organisation of the Hyderabad Contingent—Owing to misrule in Hyderabad the pay of the Contingent falls into arrears—Lord Dalhousie—Treaty of 1853 by which Berár, Dharaseo and Raichúr are assigned to the British Government as security for cost of Contingent—Attitude of the Nizám's Government during the Mutiny of 1857—Honours conferred on Nizám and Minister by British Government—Dharaseo and Raichúr restored to the Nizám and new Treaty executed—Berár and its progress under British rule—Administration of Hyderabad proper—Its disordered condition under Nizám Sikandar Jáh—Súraj-ul-Mulk appointed Minister and is succeeded in 1853 by his nephew Sálár Jang.

CHAPTER XVIII.

| | |
|--|-----|
| HYDERABAD (<i>continued</i>) | 268 |
|--|-----|

Sálár Jang—Early training—Family and antecedents—First efforts at reforming the Hyderabad Administration—Difficulties—Mutiny of 1857—Loyal attitude of the Nizám's Government—Death of Nizám, but same policy pursued by his successor—British Residency attacked by Rohillas, but insurgents beaten off and tranquillity maintained—Honours conferred upon Nizám and his Minister by British Government—Portions of the assigned districts restored to the Nizám's rule, a debt of Rsx. 500,000 due to the British Government cancelled and a new Treaty of friendship executed—Sálár Jang grateful but not satisfied, and hopes for ultimate restoration of Berár—Prosecutes his reforms with increased energy—Testimony of Sir R. Temple—Organisation of Reformed Troops with a view of supplanting the Contingent—Sálár Jang twice saved from dismissal from office by remonstrances of British Government—Made K.C.S.I. in 1867—Death of Nizám Afzal-ud-

Daulah, leaving a son less than three years old—Sir Sálár Jang appointed co-Regent during minority and promoted to be G.C.S.I.—Policy becomes more advanced—Begins to question suzerainty of British Government—Has few followers among his own countrymen, but Englishmen of position sympathise with his aspirations—In 1874 demands restoration of Berár and disbandment of Contingent—Arguments of the Memorial—Answer of the Government of India—Lord Salisbury rejects the Memorial of the co-Regents—A fresh agitation thought probable—In these circumstances Sir Richard Meade selected by Lord Northbrook for the post of Resident—The two statesmen Sir Sálár Jang and Sir Richard Meade contrasted.

CHAPTER XIX.

HYDERABAD (*continued*) 281

Arrival of Sir R. Meade—Letter from Lord Northbrook—Sir R. Meade's friendly relations with Sir Sálár Jang maintained throughout his career at Hyderabad—Lord Northbrook succeeded, as Viceroy, by Lord Lytton—Question of the Nizám's education—Difficulties raised by the Minister—Policy of the Government of India—Beneficial results of Sir R. Meade's insistence.

CHAPTER XX.

HYDERABAD (*continued*) 290

Sir Sálár Jang's visit to England—His courteous reception—Letters to Sir Richard Meade—Hopes and aspirations on returning.

CHAPTER XXI.

HYDERABAD (*continued*) 301

The Nizám invited to attend the Imperial Assemblage—After some hesitation Sir Sálár Jang accepts the invitation on behalf of his Chief, but on the eve of departure for Dehli resubmits demand for restoration of Berár—Difficulties at Dehli—Surmounted by the tact and good offices of Sir Richard Meade—Description of the Assemblage and proceedings of the young Nizám—The proclamation—Scene described—Speeches by the Chiefs and by Sir Sálár Jang—The end of the Assemblage and its results.

APPENDIX TO CHAPTER XXI.

Note on the Arrangement of the Imperial Assemblage 316

CHAPTER XXII.

HYDERABAD (*continued*)

PAGE

31

Second memorial for restoration of Berár—Railway loan—Minister's attempt to raise it secretly and on improvident terms prevented by Sir Richard Meade—Secret manufacture of arms of precision and reorganisation of the troops brought to notice by Resident and put a stop to—The co-Regent question—Sir Sálár Jang on death of Amír-i-Kabír determines to have no colleague—Government of India insist upon appointing a co-administrator—Difficulties regarding choice of a successor, as the person with best claims was disliked by Sir Sálár Jang—Views of Sir Richard Meade and Lord Lytton—Government of India after full consideration decide to appoint the Vikar-ul-Umra, brother of the late co-Regent—Sir Sálár Jang protests—Threatened resignation—Makes overtures—Declines to accept Nawáb as colleague and refuses to resign—Decided action of the Viceroy—Sir Sálár Jang yields—Installation of the new co-administrator in special Durbar described—Despatch of the Government of India—Thanks and congratulations conveyed to Sir Richard Meade—Letter from Lord Northbrook—Working of the new arrangement—Attacks by the press upon the Nawáb—His death—His son, Ikbál-ud-Daulah, now Prime Minister in Hyderabad—Final decision of the Berár Question—Accepted by Sir Sálár Jang and colleague—Congratulations from the Viceroy and Lord Northbrook—Result beneficial both to the British Government and to the Hyderabad State.

APPENDIX TO CHAPTER XXII. 337

CHAPTER XXIII.

HYDERABAD (*continued*)

341

Sir Richard Meade asks permission to resign—Reply of the Viceroy—Owing to financial losses Sir R. Meade constrained to delay retirement—Gratifying letter from Lord Lytton—Afghan War—Loyal conduct of Sir Sálár Jang and the Hyderabad Chiefs—Anxiety in Hyderabad, but dangerous movements effectually checked—Administrative improvement—Striking change in attitude and conduct of Minister—Lord Lytton resigns office and is succeeded by the Marquis of Ripon—No material change of policy in Hyderabad—Affairs being tranquil, Meade gratefully declines prolongation of office and retires in March, 1881—Letter from Foreign Secretary—Public banquet in honour of departing Resident—Farewell letter from Sir Sálár Jang—His death and character.

CHAPTER XXIV.

| | PAGE |
|------------------------------|------|
| CALUMNIOUS ATTACKS | 351 |

Calumnious attacks in the *Statesman*—Position of a retired Anglo-Indian in such cases—Meade seeks to proceed against his traducer in a court of law—The Government of India recommends that he should be allowed to do so at public expense and to produce official papers—The Home Government considers proceedings unnecessary and inexpedient—Refuses Meade permission to publish vindictory despatches, but Lord Hartington makes a statement in the House of Commons—Letters of sympathy from Lord Northbrook, Lord Lytton and other English friends and from Sir Sâlar Jang—Observations of the *Pioneer* newspaper—Attacks renewed in 1883—Questions, based on the attacks, asked in the House of Lords, but the House refuses to hear them—An official letter sent to Meade expressing the Government's sense of the utter groundlessness of the attacks—Attacks repeated in India in an aggravated form—Meade protests and again receives handsome letters from the Government, but their publication still disallowed—Lord Lytton strongly of opinion that Meade should receive some public proof of confidence—But nothing further done during Meade's lifetime—Extracts from the despatches now published for the first time.

CHAPTER XXV.

| | |
|----------------------|-----|
| LAST YEARS | 364 |
|----------------------|-----|

Remaining years in England—Meade's busy and useful life—Health begins to fail—Proceeds to Hyères in February, 1894, and dies—The closing scene described by Mrs. Caine—Memorial window and inscription in the church at Innishannon—Concluding remarks on Meade's character and services.

| | |
|-----------------|-----|
| INDEX | 375 |
|-----------------|-----|

LIST OF ILLUSTRATIONS, ETC.

| | |
|---|---------------|
| Portrait of Sir Richard Meade | Frontispiece |
| Map of the Indian Empire, with the States and Territories in which Sir Richard Meade exercised Jurisdiction coloured Dark Yellow | Facing page v |
| H.H. Jāya Ji Rao Sindhia, Mahārāja of Gwalior | 18 |
| Dinkar Rao, afterwards Rāja Sir Dinkar Rao, K.C.S.I., Minister at Gwalior | 20 |
| The Morār River, with the Gwalior Fortress in the Distance. | 34 |
| The Residency, Indore | 92 |
| The Ruins of Mándú | 96 |
| View on the River in the Residency Grounds, Indore | 102 |
| H.H. Tukoji Rao Holkar, Mahārāja of Indore. Bhopāl | 108 |
| The Gwalior Fortress | 110 |
| H.H. Chāma Rajendra Wadiar, Mahārāja of Mysore (at. fifteen years) | 114 |
| H.H. Malhar Rao, Late Gaekwar of Baroda (Deposed for Maladministration) | 149 |
| H.H. Syaji Rao, Gaekwar of Baroda (at. twelve years); the Mahārāni Jamna Bai (his adoptive mother); Tara Bai (her daughter) | 162 |
| Sir Mādhava Rao, K.C.S.I., Minister at Baroda | 224 |
| H.H. Mīr Mahbūb Ali Khān, Nizām and Subahdār of Hyderabad and the Deccan (at. ten years) | 227 |
| The Residency, Hyderabad | 253 |
| His Excellency Sir Sālār Jang G.C.S.I., Minister at Hyderabad | 254 |
| | 276 |

CHAPTER I.

BIRTH, PARENTAGE, AND EARLY YEARS.

Birth and parentage—Account of the Meade family—Their attitude in the Irish rebellions of 1568-1601—Execution of Patrick Meed—Conduct in the Civil War—Meade's father and mother—Innishannon and its surroundings—Meade's education and early life—Appointed cadet in the East India Company's service.

GENERAL SIR RICHARD JOHN MEADE, K.C.S.I., C.I.E., the subject of this memoir, was born on the 25th September, 1821, at Innishannon, a picturesque village on the river Bandon, about seven miles (by road) from Kinsale, County Cork; and was the eldest son of Captain John Meade, R.N., and Elizabeth, daughter of Thomas Quin, Esq., K.C., of Fir Grove, Innishannon.

His father's family, variously designated in earlier writings *Le Med*, *Miagh*, *Mcagh* and *Meed*, is one of the oldest in the county.

Settled, from a remote period, in the valley of the Bandon, it held, in the sixteenth century, a high position among the burghers of Kinsale, a quaint old town on a steep hill-side, overlooking the land-locked estuary which forms the harbour; a town full of historic memories,—of Danish raids and settlements in days gone by, of fights with Spanish fleets in later times, of Rupert, of Cromwell, of James II., of Marlborough, and giving a name to the great headland, which, towering high above the waves of the Atlantic, serves as a beacon to the liners from the West.

To return to the family:—

There is a deed still in existence executed by Adam Meagh of County Cork in the year A.D. 1341, making grants of nineteen manors to certain persons specified, to which his seal is appended, comprising a coat-of-arms almost identical with that now borne by the Meade family.

A stone tablet, on the north side of the altar in the old church of Kinsale, states in Latin that "Patrick Meed, often sovereign [*i.e.* mayor] of Kinsale, rebuilt this sanctuary in A.D. 1558, for the good of his own soul and the souls of his parents". In his will, preserved in the British Museum, he leaves Tysassany¹ (Tissasson)—two miles from Kinsale—and Knocknacorry to his son Robert, a third part of his land to his wife, and the remainder to his son Richard.

Patrick Meed (or Meagh) perished on the scaffold in 1577 during the troubles in Elizabeth's reign, when the Meaghs were, according to Smith, the historian of Cork, "among the chief lords and gentles of the county".

What was the particular offence with which Patrick Meed was charged is not stated, but it is probable enough that, as a staunch Roman Catholic and leading citizen, he was implicated in the great Desmond rebellion, which, for fifteen years,—from A.D. 1568 to A.D. 1583—desolated the province of Munster.

Queen Elizabeth's policy of forcing Protestantism upon an unwilling population and the high-handed proceedings of her Lords Deputies had caused wide-

¹ Tysassany means "place of the Saxons," and refers, doubtless, to some old Saxon settlement in that locality.

spread disaffection,¹ and when, with the Pope's blessing, James Fitzmaurice of Desmond raised the standard of revolt he was joined, we are told, "by all the English and Irish of Munster from the Barrow to Cape Clear". Each British triumph was followed by wholesale executions; and it was, doubtless, on one of these occasions that Patrick Meed fell victim.

But executions failed to stem the tide of disaffection. Then wholesale forfeiture was tried, and attempts made to "plant" the confiscated lands with British settlers. But all in vain. The Munster confiscations² were followed in 1589 by a general insurrection of the Irish clans, until in 1601 a Spanish fleet of fifty sail, under Don Juan del Aguila, entered the harbour of Kinsale and, with the connivance of the leading men, including presumably the Meaghs, occupied the town. On this occasion, we are told, "the sovereign [or mayor] opened the gates to the invaders, with his white wand in his hand, going to billet and cess them in several houses, more ready than if they had been the Queen's forces". And when the Queen's forces, under Mountjoy, advanced for the recapture of the town and fort, they found the entire population hostile; and when the clans which had flocked to the assistance of the invaders were defeated and driven off, they reassembled—it may be noted—at Innishannon, afterwards the home of the Meade family.

¹ Holinshed informs us that a deputation was sent from Ireland to remonstrate. The Queen in Council, however, instead of redressing grievances, imprisoned the members of the deputation, but, at the same time, observed to her Lord Deputy that, "though her Irish subjects had behaved badly, they should be *pulled*, not *flayed*".

But whatever may have been the attitude of the Meaghs towards their Sovereign in 1577 and 1601, it was, in after times, extremely loyal.

During the Civil War, Robert Meagh of Tissanon (grandson of the Robert Meagh above named, and great-grandson of Patrick Meed) was a staunch Royalist. Prince Rupert is said to have obtained shelter in the mansion, and, in acknowledgment of the service rendered, to have left a picture of himself and a chain which were long kept as heirlooms in the family. A ditch once surrounding the mansion (which has disappeared) is still locally known as "Rupert's Trench".

But Robert Meagh suffered severely for his loyalty. Eighteen properties are mentioned in Cromwell's "Book of Forfeitures" as having been confiscated from him and others of his name, and it is said that the family mansion was, for a time, occupied by Cromwell's son-in-law Ireton.

After the Restoration Robert Meagh regained all he had lost, but was again deprived of his estates at the Revolution of 1689. The estates were then granted to his nephew Richard Meade, a Protestant, and ultimately passed to Richard's nephew Martin, from whom the subject of this memoir was a direct descendant.

The land on which the old house of Tissanon stood is in the possession of De Courcy Meade, Esq., (Sir Richard's cousin), but the original estate has been divided, and a large portion has passed into other hands.

Sir Richard's grandfather, Richard Meade, took holy orders, and became Rector of Innishannon (about eight miles from Tissanon), and married Mary,

eldest daughter of the twenty-fifth Lord Kingsale, whose family, De Courcy, claims descent from Charlemagne, and whose peerage is the oldest in the United Kingdom.

Captain John Meade, Sir Richard's father, was the second son of this marriage. He joined the navy in 1798, and was present, as midshipman on board the *Magnanime*, at the action off Lough Swilly, when the French line-of-battle ship *Hoché*, with Wolfe Tone on board, was taken. He was on active service in American waters until 1808, when he joined the *Tonnant* under his uncle, Admiral de Courcy, off the coast of Portugal, and witnessed the battle of Corunna—afterwards doing his best to alleviate the sufferings of the troops. After a few more years' service on the Brazil station he retired and married in 1814,—devoting the remaining years of his life, thirty-seven in number, to the education of his family of five daughters and four sons, and to the kindly treatment of those around him. Besides possessing the generous instincts and practical training of a tried naval officer, he was blessed with a specially happy temperament, was a universal favourite and general peacemaker, and was one of the few naval officers of the period who was never known to use an oath.

Sir Richard's mother was, as we have stated, Elizabeth, daughter of Thomas Quin. Her father was a lawyer of considerable repute and good family. She was a lady of strong convictions and much religious earnestness; but her religious opinions being of a somewhat severe and gloomy character, her views of life and happiness presented a marked contrast to those of her eminently blithesome husband.

Their son Richard, whose earnestness of purpose was as remarkable as the geniality of his disposition, seems to have combined in these respects the virtues of both parents.

However this may be, the subject of our memoir was connected (it will be perceived), both on the father's and the mother's side, with the old landed gentry of the South of Ireland—a class not favourably known, perhaps, for thrift, but which has long been distinguished for pluck, courtesy, and cheeriness; and has produced many distinguished members of the civil, military and naval services of the Crown,—including, with many others, the present Marquis of Lansdowne, Admiral Lord Clanwilliam (a Meade), and his brother, Sir Robert Meade, the late Under Secretary at the Colonial Office, F. M. Lord Roberts, Lord Charles and Lord William Beresford.

Meade's father was, as we have seen, in the navy; one uncle, Lieutenant Michael de Courcy Meade, of the 39th Regiment, fell at the battle of Vittoria; another, General Frederick Meade, of the Connaught Rangers, served through the Peninsular War, and was badly wounded at the battle of Salamanca; he then proceeded to India on the staff of Sir Thomas Reynell and took part in the second siege and capture of Bhartpur, under Sir Stapleton Cotton, afterwards Lord Combermere, and was the proximate cause of his nephew's adopting an Indian career. Sir Richard's two younger brothers (one still living) were in the Royal Marines.

Innishannon, the birthplace of Sir Richard Meade,

is a pretty village in one of the loveliest portions of the valley of the Bandon River:—

“The pleasant Bandon crowned with many a wood,”¹

a blending of hill and dale, forest and running water, with glimpses of ruined castles, offering a succession of views of romantic interest and beauty.

“Among such scenes,” says Major Meade, “my father and his brothers were brought up.

“Here,” continues Major Meade, “they mixed with the country people, the frank Irish peasantry, who formed the back-bone of the battalions who fought in the Peninsula and were to fight in India. Here my father must have acquired his taste for riding,” fishing and boating which he retained through life; and received an early training which left its impress on his character.

better equipped with general knowledge than many who now-a-days pass competitive examinations after long and expensive cramming. 'Your father,' said an old friend of his to me, 'was one of the best men all round I ever met with. Some men are good at one thing, and some at another, but your father could do everything well. He was a good rider and shot, and was, besides, an accomplished musician, good draughtsman and billiard player.'

"In after years my father became vice-president of the council of his old school, and it was a curious coincidence that a namesake, Admiral Lord Clanwilliam, who is also a Richard Meade, head of the Meades of Ballintober, another branch of the family, was president of the council at the same time.

"It was originally intended that my father should go into the navy, and, when he was ten, a naval cadetship was offered for him by Lord Lauderdale, my grandmother's cousin; but my grandfather, upon consideration, decided to save his son 'from the miseries he had himself endured'. Ultimately, through the influence of his uncle, my father and his two brothers entered the army. Before the age of seventeen my father obtained, through my grandfather's cousin, Sir A. Agnew, a cadetship in the East India Company's service, and started for India *viâ* the Cape of Good Hope in March, 1838."

CHAPTER II.

INDIA—FIRST NINETEEN YEARS.

Proceeds to Arracan—After holding various temporary appointments joins the Gwalior Contingent in 1845—Origin and history of Contingents explained—Advancement in the service—Marriage in 1853—Proceeds to Burmah and serves for a year as Assistant Adjutant-General of the Pegu Division—Returns to Gwalior, 1855, until the outbreak of the Mutiny of 1857.

YOUNG Meade reached Calcutta in July, 1838, and was at once posted as ensign to the 58th N.I., but was transferred in the following November to the 65th N.I.—on the *cadre* of which he remained until he elected to join the Bengal Staff Corps. The 65th N.I. was stationed in Assam, and consequently took no part in the campaigns on the North-West frontier, but was engaged in garrison duty in our recently acquired province of Arracan and Tenasserim.

This monotonous duty gave little scope for his abilities, but he took the opportunity of mastering Persian and the vernacular languages of the Presidency, and while his social qualities rendered him a general favourite, he was soon recognised as a very promising officer.

He became a lieutenant in March, 1840, and was appointed in February, 1841, to officiate as interpreter and quartermaster of his regiment.

During the next two years he was employed in the

Commissariat Department in Dinapur and Cawnpore: in 1844 he returned to his regiment as interpreter and quartermaster; in October, 1845, he became station staff officer at Nowgong in Bundelkhand, and two months later was appointed second in command of the 6th Infantry Battalion of the Gwalior Contingent.

And here it may be well to explain, for the benefit of the general reader, that a "Contingent" *was* a special force, maintained in some of the principal native States at the expense of the ruling chiefs, to enable them, in accordance with the terms of their engagement, to co-operate effectively with the British Government in time of war, and to maintain order in their territories in time of peace.

The organisation of such special forces was the outcome of a policy, greatly extended and developed (if not invented) by Lord Mornington, afterwards Marquis of Wellesley, between 1798 and 1805, and continued, after an interval of disastrous reaction, by Lord Moira, afterwards Marquis of Hastings, between 1813 and 1822, and by Lord Dalhousie and most of his successors—the policy of welding together the principal States of India with the British Government, as Paramount Power, for joint defence against external danger and the maintenance of internal peace: a policy long accepted as the only true one for England in India, though the degree and method of its enforcement have varied and will vary from time to time.

It was effected in the days of Lord Hastings and his great predecessor by a system of treaty-engage-

ments, known as Subsidiary Alliances, most of them still subsisting, their main object being, to quote Lord Hastings' words, "to render the British Government paramount in effect, if not declaredly so, to hold the other states as vassals, though not in name, and to oblige them in return for our guarantee and protection to perform the two great feudatory duties of supporting our rule with all their forces, and submitting their mutual differences to our arbitration".

In furtherance of this policy a detachment of the British army, technically known as the Subsidiary Force, was located within or near the boundaries of the State concerned, for its protection from aggression and the maintenance of the ruler's legitimate authority.

But this force, it should be explained, was not to be employed on ordinary duties of civil administration, or collection of the revenues; indeed, the British Government generally agreed not to interfere in such matters, but only on occasions of importance.

Per contra a subsidy, sufficient for the charges of the force, was furnished by the protected State, either in periodical money payments or by territorial cession, more frequently the latter; and at the same time, a force of native troops—known as the Contingent—of a strength and character defined in the engagement, was to be maintained in readiness to act with the British troops, and for its efficiency the protected State was answerable.

Many important consequences followed from the relation thus established between the Paramount Power and its subordinate allies, but they need not be referred to here. Suffice it to say that, under the

provisions of the several engagements, Contingents of various strength were arranged for in all the principal States of Central and Southern India.

But it was found in practice that, while the British Government's part in the transaction—*viz.*, the furnishing of an efficient Subsidiary Force,—was faithfully performed, the native Contingent was often unready when called for, and when furnished, inefficient and unreliable.

In these circumstances some of the principal States were induced to place their Contingents under the command and control of British officers; and in this way "anglicised" Contingents were formed in Hyderabad, Bhopál, Málwa, Gwalior, and elsewhere.

The services of some of the reformed Contingents, notably that of Hyderabad, were very valuable; but the conduct of several in the great Mutiny gave the system, as then practised, a bad name, and many were disbanded; but the system still survives, under another name and altered conditions, in the Imperial Service Corps, which many of our Feudatories are now maintaining; a special force, not "anglicised," like the old reformed Contingents, but subject to the *inspection* of selected British officers. Some of these Imperial Service Corps, especially those of Kashmír and Hunza, have already done brilliant service in campaigns, and nine have taken part with the Imperial forces in the recent military operations against the tribes of the North-West frontier and earned the hearty thanks of the British Government.¹

¹ During the late campaign on the North-West frontier, Imperial Service Corps from the following States were employed:—

But we are greatly anticipating events and must return to the Gwalior Contingent as it was in 1845. This force was originally formed in 1817 by the Marátha chief, Daulat Rao Sindhia, with a view of effectually co-operating with the British Government in the suppression of the Pindári hordes. It was, at first, far from efficient, but was afterwards reorganised by his successor and placed in charge of British officers.

After the mutiny of the Gwalior army in 1843 and its destruction at the battles of Maharájpur and Panniar the Contingent (which had behaved excellently) was enlarged, and consisted, when Meade joined it, of seven infantry and two cavalry regiments and five batteries of artillery; it had a full complement of English officers and was recruited (unfortunately as it happened) from the same sources as the British sepoy army.

With this corps he served continuously (except for a short time in 1853-4) until he joined the Political Department in 1859.

In October, 1850, he was made officiating Commandant of his regiment, and in 1851, Brigade-major of the entire force; Paymaster in 1852, Commissariat officer

| | |
|---------------------------------------|--------------------------------|
| Patiála (Sikh), cavalry and infantry. | Jodhpur (Rájput), lancers. |
| Jhínd (Sikh), infantry. | Sirmor (Hill Rájput), sappers. |
| Nábha (Sikh), infantry. | Jaipur (Rájput), transport. |
| Kapúrthala (Sikh), infantry. | Gwalior (Marátha), transport. |
| Maler Kōtla (Muhammadan), sappers. | |

*H.H. the Maharája of Patiála, Maharája Sir Partáb Singh of Jodhpur and the Maharája of Kúch Behár acted as extra aides-de-camp to the General commanding; and General Elles, in his despatch on the operations of the Mohmand Field Force, reports that "the Imperial Service Corps under his command had proved their fitness to fight in the first rank".

in 1853, holding the three appointments conjointly. His work, therefore, must have been constant and engrossing, but he found time during this period to pass with credit a departmental examination in civil engineering.

Early in 1853 an event of great importance for his future happiness occurred. Captain Meade was united in marriage with Emily, second daughter of Colonel Duncan Malcolm, then Resident at Gwalior, a very promising member of the political service,¹ and nephew of the great soldier, statesman and historian, General Sir John Malcolm—a distinguished member of the “galaxy of talent” which gave “solidity and splendour to the Company's government during the first quarter of the present century”.

Mrs. Meade's sister was in the following year married to Captain, now General Sir John, Murray, who raised the cavalry regiment, well known during the Mutiny under the name of “Murray's Ját Horse” and now as the 14th Bengal Lancers.

In 1852 war broke out with Burmah, and Meade hoped for active service, but his old regiment, the 65th N.I., though not far from the scene of operations, was required for garrison duty in Arracan and was not moved to Rangoon until the close of the war. Meade at once rejoined his regiment, but by the time it

¹ He had been for many years assistant to the Resident at Hyderabad, where Lady Meade was born, and was afterwards Resident at Jodhpur in Rájputána. He left Gwalior and became Resident at Baroda in 1854, where he died at the early age of forty-seven, one month after the death of his wife.

arrived in Rangoon the war was practically over and the annexation of Pegu proclaimed. He was appointed Assistant-Adjutant General for the Pegu Division, but saw no opening for military distinction, and, accordingly, after an uneventful year of service in Burmah, returned early in 1855 to his old post in Gwalior.

He was again appointed Brigade-major of the Contingent, and for two years carried on the ordinary duties of his office without the slightest anticipation of the event which was the turning-point of his career—the great Mutiny—which, after smouldering for a considerable period, burst into flame at Meerut on the 10th May, 1857, then rapidly extended from one military station to another, and lost us temporarily all the central portion of Northern India.

As to its cause or causes—whether they were religious, or political, or social, or all combined—opinions are endless, but there can be no doubt that the revolt was primarily a military one, the result of growing disaffection in the native army, and especially that portion of it recruited from the recently annexed territories of Oude; the rebellious movement consequently extended not only to troops forming part of the British native army, but to the Contingents of our native allies which had been recruited from the same localities.

What happened at Gwalior will be narrated in the next chapter.

•

CHAPTER III.

GWALIOR.

Account of Gwalior—Its extent, population, and political condition in 1857—Sindhia—His antecedents—Invested with full powers of sovereignty in 1852—Appoints as his Minister Dinkar Rao—Dinkar Rao's reforms—Major Malcolm, the political agent, transferred to another appointment—Dinkar Rao dismissed from office, and affairs fall into confusion—Is reinstated on the representation of Major Malcolm's successor, Major Charters Macpherson—Visit of Sindhia to Lord Canning in 1857—Its effect—Description of the town, fortress and cantonments of Gwalior.

GWALIOR is the most important of the group of Feudatory States¹ which occupy the table-land of Central India, between the Bombay Presidency on the South-West, and the Valley of the Jamna on the North-East.

It comprises the remnant of the territory of Sindhia left after the Marátha wars of 1803, 1817, and 1843 ;

¹ The term *feudatory*, as applied to the Protected Chiefs and States of India, has been objected to. From a purely legal point of view the term is, of course, inaccurate ; but there is much to be said in its favour, and it has, *inter alia*, the sanction of long usage. *Vassal*, the proper correlative of *Suzerain*, offends susceptibilities ; and *Dependent* is open to the same objection. *Subordinate Ally*, a term sometimes employed, is apt to be misleading and is often cumbrous. *Native Prince* is not sufficiently distinctive, as it includes titular as well as territorial chiefs, and, for this and other reasons, is not favoured by the latter. Upon the whole the term *feudatory* seems at once the most descriptive and least open to serious objection.

but even now has an area of more than 30,000 square miles—an area, that is to say, larger than Scotland—and a population of about 3,000,000.

The population is extremely mixed, comprising, besides Maráthas (the ruling race), Rájputs, Játs, Ahírs, Gújars, Brahmans, Bundelas and other Hindu races, with a sprinkling of Muhammadans: but the various races are not, as is generally the case in British India, blended into one organised community, but form a collection of local and tribal chiefships. Eight of these chiefships are “mediatised”—that is, held on conditions guaranteed by the British Government; but most of them are at the mercy of the Marátha chief; and one of the functions of the Contingent was to aid him in keeping these petty chiefs, whether “mediatised” or not, in order.

This state of affairs, it may be observed in passing, however objectionable from the point of view of civilised administration, was not without its advantages in the dark days of 1857.

Sindhia is the family name of a series of Marátha chieftains who rose to importance on the decadence of the great Marátha power established by Sívaji and his successor. At the close of the last century, Mahadoji Sindhia, the second of the series, exercised dominion, not only in his hereditary fief in Málwa, but in Broch (on the Gulf of Cambay), in the fairest portions of the Deccan, in Dehli and Agra, in Rájputána and the Sikh States south of the river Satlaj. With the help of a sepoy force, 26,000 strong, organised by Count de Boigne, on the model of British battalions, he became the most formidable member of the Marátha Confederation, and though nominally

servant of the *Peshwa*,¹ was in reality the ruler of Hindústán.

The name of his successor, Daulat Rao Sindhia, figures largely in the Marátha wars of 1803 and 1817, and his northern army, commanded and officered by Frenchmen, constituted the most formidable force we had to deal with in the early years of the present century.

But his power was completely broken by Wellington (then Sir A. Wellesley) at Assay and Argaum, and by Lake at Aligarh, Dehli and Laswári; he was stripped of all his outlying dominions, and by the treaties of 1803-4-5, and subsequently those of 1817-8, he accepted the position of a Protected Feudatory.

The representative of the family, who held the chiefship at the time of the Mutiny, was Ali Jah Jáya Ji Rao Sindhia, a son adopted by the widow of Daulat Rao's successor, who had died childless in 1843. He was recognised by the British Government, but, under the influence of intriguers, the army rose in mutiny and tried to usurp supreme power in the State; whereupon the British Government, in accordance with its treaty obligation, intervened to protect the dynasty; defeated and destroyed the rebellious army at Mahárájpur and Panniar and placed the young chief, then ten years old, upon the throne; and, by a treaty executed in 1844, the Contingent, which had done good service in the war, was increased, and the extra cost provided for by territorial cession; while the rest

¹ *Peshwa* was the title given to the hereditary prime minister, and director of the Marátha Confederacy under the nominal headship of the *fainéant* representative of Sívaji, the founder.

of the chief's army, was reduced to moderate dimensions.

The Gwalior Chief thus owed his position, and probably his life, to the British Government, and he was not ungrateful. During his minority his conduct was said to be "exemplary," and in 1852, on the death of the President of the Council of Regency, it was decided to invest him with the full powers of the chiefship, ten months before the time appointed in the treaty. At the same time he was induced to appoint as his minister a young Marátha Brahman, of Gwalior, by name Dinkar Rao, afterwards Rájá Sir Dinkar Rao, whose character and rare ability had been discerned by the Political Agent, Major Malcolm.

The minister soon justified his choice, and threw himself energetically into the work of administrative reform. Within less than two years, law and order were established to an extent previously unknown; fiscal oppression was put a stop to; taxation reduced; the subordinate races fairly dealt with; roads constructed; transit duties abolished, and the foundations of an educational system laid, while, thanks to diminished peculation, and a large increase of the cultivated area, the revenues of the State expanded.

But Major Malcolm obtained promotion and proceeded to Baroda, and Gwalior for a time was left to itself, and the result was somewhat disastrous. During the interval which elapsed between Major Malcolm's departure and the advent of his successor, the young Chief, who chafed under the tutelage of the Paramount Power, rashly took the reins into his own hands. The

minister, whose reforms had made him a host of enemies, was virtually dismissed from office, and affairs soon drifted into dire confusion.

Fortunately Major Malcolm's successor was an officer of ripe experience and earnestness—Major Charters Macpherson, who had spent the best part of a noble life in humanising the wild races of the Khonds in the malarious hill-tracts of Southern India. Under his influence Sindhia soon saw his error and restored his minister to office, if not to favour, and the administrative reforms were again pushed on.

Early in 1857 Sindhia was taken to Calcutta to pay his respects to the new Viceroy, Lord Canning. He was much pleased at the graciousness of his reception and the assurances conveyed to him that his dynasty would be maintained. He was also greatly impressed with the power and the resources of the British Government; but at the same time he regarded with far more anxiety than British statesmen the signs of disaffection which had manifested themselves in our native army. What his attitude would be towards the Paramount Power in times of difficulty was then far from certain, but it was matter of supreme importance to the British Government.

The territories of the State are scattered; but the northern and most important portion abuts on the valley of the Ganges and its tributaries, and its capital Gwalior is only sixty miles from Agra. The ancient fortress and citadel crowns a precipitous ridge of ochreous sandstone, running from south to north; well under the north end of the ridge (its highest part) lies the old



DINKAR RAO
(afterwards Rájá Sir Dinkar Rao, K.C.S.I.),
Minister, Gwalior.

town, close-packed and irregularly built; on the south-west stretches the Lashkar, or military quarter, formerly the standing camp of the Marátha army—now “a filthy collection of mud buildings”—bisected by the bed of a small river flowing round the east side of the town and fortress, towards the river Chambal; in the midst of the Lashkar is the palace of the Maharája.

Morár, the site of the cantonments of the Contingent force, is three and a half miles east of the town, and five miles north-east of the Lashkar,—on the far side of a deep torrent-bed, spanned by a handsome bridge.¹ Until the preceding rainy season the torrent (known as the *Morár Naddi*), held up by an embankment, flowed by the cantonments in a deep stream; but, providentially, a flood during the last July had carried away the embankment, so that, at the time of the Mutiny, the water was spread out and shallow and thus easily fordable by fugitives. On the west side of the river runs the road to Agra. On the road to Agra, seven miles from the town, was the British Residency.

* The Political Agent, as we have stated, was Major Charters Macpherson; his immediate superior, the Governor-General's Agent at Indore, was Lt-Col. (afterwards Sir Henry) Durand, C.B., R.E., who was acting for Sir Robert Hamilton; the Commander of the Contingent was Brigadier Ramsay, and his Brigademajor was Captain Meade.

¹ This somewhat inconvenient situation was probably selected on military grounds to protect the Contingent from possible attack by Sindhia's army in the event of a repetition of the occurrences of 1843. The possibility of the Contingent mutinying was not thought of.

The force at Gwalior consisted of three infantry, two cavalry regiments and two batteries of the Contingent (stationed at Morár)—the remainder being at Nimach, Ágar, Lalitpur and elsewhere—and Sindhia's army (nearly 10,000 strong) located in the Lashkar. There were no European troops nearer than Agra, and only a single regiment and battery there.

Such was the situation in Gwalior when the tidings came of the outbreak at Meerut, and the occupation of Dehli by the mutineers.

CHAPTER IV.

THE MUTINY AT GWALIOR.

Effects of outbreak at Meerut—Attitude of the Brigadier—Action of Political Agent—Loyal conduct of Sindhia—Ladies and children sent to the Residency and then to the palace for protection—Proceeding disapproved of by the Brigadier—Mrs. Meade and her sister return to cantonments and are followed next day by the other ladies—Action of Brigadier approved by Government of India, and Mrs. Meade and Mrs. Murray's conduct officially eulogised—Anxiety—Outbreak on the 14th June—Conduct of sepoys—Mrs. Murray's narrative of the escape of Captain Meade and those with him from cantonments to the Phulbágh Palace—Political Agent and fugitives leave for Agra on following morning—Sindhia promises to do his best to detain the mutineers at Gwalior—Perils of the journey—Difficulties at the river Chambal—A band of fanatics—Baldeo Singh, a Brahman chief, comes to the rescue and passes them over the river into the Dholpur State—Loyal conduct of its chief—The party reach Agra on the 17th—Rewards to Baldeo Singh and the Rána.

THE news of the events at Meerut and Dehli naturally caused serious alarm at Gwalior,¹ but the Brigadier

¹ Of the events in Gwalior following the Meerut outbreak the best general account is to be found in the despatches of Major Macpherson, the Political Agent, which have been embodied in chap. xxiii. of the memoir of that distinguished officer's services published by his brother in 1865.

Of the outbreak in the cantonments of the Contingent force and the escape of the fugitives to Agra the most graphic narrative yet published is that of Mrs. Coopland, wife of the chaplain (who was one of the victims), in a volume entitled *A Lady's Escape*

and his officers generously clung to the belief that their own men at any rate were faithful.

The Brigadier was pressed to send the women and children from cantonments to the Residency, where Sindhia promised to have them protected by a Marátha guard ; but the Brigadier, still believing in his sepoys and unwilling to show distrust of them, declined the offer.

And here we must pause to say a word in praise of the service rendered in this crisis of affairs by the Political Agent at Gwalior. Without derogating from the credit due to the Marátha Chief and to his minister, whose conduct deserves the highest recognition, it is only due to the memory of a deserving officer to mention that the Government was at this juncture most faithfully served by its representative at the Court of Sindhia, "who"—to quote the words of Lord Canning's minute—"holding a post of great importance, far removed from his immediate superior at Indore, and often struggling against sickness, discharged his difficult duties with complete success". He was in constant—almost hourly—communication, personally or by letter, with the minister and his chief, and by patient argument and, what is more, by the powerful influence of an earnest and upright character, made the latter at length to feel that loyalty to the British Government was not only his duty but the best policy ;

from Gwalior, extracts from which are given in Colonel Malle-son's work.

These form the basis of the present narrative, but it has been supplemented by information and letters placed at the writer's disposal by Sir Richard Meade's family.

for it was pointed out with irresistible force that the destruction of British rule would mean, in his case, the simultaneous rising of the Játs, the Rájputs, and other warlike tribes within his territory, at present kept in order by the prestige and power of his great Ally and Suzerain.

Thus influenced Sindhia did his utmost in this anxious time to co-operate with the British Government.

On the 11th of May he placed at the disposal of the Lieutenant-Governor of the North-West Provinces one and a half regiments of infantry, 100 horse and a battery—one half of the Contingent force at Gwalior; on the 13th he agreed to the despatch of a regiment of cavalry; on the 14th he despatched half his own body-guard and a horsed battery to Agra; on the 22nd of May he sent the 1st Infantry Regiment of the Contingent together with his personal Marátha troop of cavalry to assist the local authorities of Etáwah, and on the 27th of May he gave warning that “the Contingent sepoys had entirely ceased to be servants of the British Government”.

This warning was duly communicated to the Brigadier; but, while admitting that there were mutinously disposed men amongst his troops, he refused to believe that, as a body, they were unfaithful.

At length, however, the Brigadier became alarmed. On the 28th of May, having received intelligence that the sepoys of the Contingent were to mutiny that night, he issued directions that, when the ladies were out for their usual evening drive, they should take their children with them to the Residency.

This was done, and the ladies of the station, with their families, proceeded in melancholy procession to the place indicated, firmly believing that their husbands, who were to be left in cantonments, would all be murdered. But outside cantonments the outlook was not promising, for on the road they met a body of Marátha horsemen, who galloped wildly round the carriages, calling out, "These people's hearts are broken". They began to fear for their own lives too, and entered the Residency with very sad forebodings.

As no warning of their advent had been given, there had been no time to prepare for their reception; so, in spite of the kind exertions of the Agent's sister, a night of great discomfort followed. But the minister was there and instantly rode off to inform his chief. Sindhia promptly came in person, with a strong body of horse, and posted parties in and near the Residency for its protection. At the same time he strongly recommended that the ladies and their families should be brought next morning to a large English mansion in the palace precincts, as he would be better able to protect them there, while he would thus publicly demonstrate his determination to support the British Government.

The arrangement was gratefully accepted by the Political Agent, and next morning it was carried into effect. The sad *cortège* was headed by a carriage containing the Agent and his sister, Mrs. McLeod Innes, who had anxieties of her own—for her husband, Lieutenant (now General) McLeod Innes, V.C., R.E., was one of the Lucknow garrison—and was preceded and followed by detachments of Sindhia's body-guard. It had to pass through the crowded streets of the

native town, and the roof of every house was covered, it is said, with "jeering and insulting spectators,"—a proof that, in electing to "support the British Government," Sindhia was risking the allegiance of his own people; a fact creditable to His Highness's loyalty, but not encouraging to the fugitives.

But the party reached the precincts of the palace without mishap. There had been no time to get the mansion ready for so large a party, so a good deal of discomfort was inevitable; but discomfort was not all that had to be complained of, for the reception was in other respects far from friendly. In the case of the Political Agent, indeed, and those with him, the Maharáni and the chief's adoptive mother, the Baiza Bai, sent kindly messages and dishes from their own table, but the rest of the fugitives (owing probably to the hostile feeling of the chief's *entourage* and servants) were treated with marked neglect and scant courtesy; while the two gentlemen of their party—the chaplain and the young son of a colonel (Hennessey)—were made to deliver up their arms, a circumstance which naturally caused much uneasiness.

That night the General and staff and artillery officers slept in front of the loaded guns, and all passed off quietly. The Brigadier began to think the alarm was false, to trust the sepoys more and Sindhia less. He strongly disapproved of the removal of the ladies and children to the palace and requested their return.

The minister, the Political Agent and others deprecated this course; but Mrs. Meade, whose husband, believing the position of the palace (in the heart of the Lashkar) to be dangerous, desired her return, deter-

mined to rejoin him at all risks; and her sister Mrs. Murray decided to accompany her. They returned accordingly and on reaching the cantonments received an ovation from the sepoys, who expressed the greatest delight that the ladies should have shown this mark of confidence in them.

The Brigadier was more than ever convinced that the alarm had been a false one, insisted upon all the other ladies and children returning to cantonments, and reported his proceedings, through the Agent at Indore, to the Government of India. The Government, in concurrence with the officiating Agent—Lieut.-Colonel Durand, no mean authority—entirely approved of the proceedings of the Brigadier, and paid the following handsome tribute to the conduct of the ladies:—

“The Governor-General in Council [so runs the despatch] has viewed with the warmest admiration the calm confidence and decision, and the noble indifference to personal danger exhibited by Mrs. Meade and Mrs. Murray in disregarding the threatened outbreak, and returning to cantonments when they were informed by the Brigadier that their remaining at the palace was fraught with mischief”.

The ladies and children returned to cantonments, but there was still anxiety. Day after day brought fresh tidings. There had been mutiny at Ajmīr and Nasírábád and Rohilkhand, and there was ominous absence of news from Cawnpore and Allahábad. On 4th June the 7th Regiment of the Contingent, which was stationed at Nímach, revolted and marched to Agra, and other detachments of the force at Sípri and Lalitpur were more or less disaffected.

On the 12th a sanguinary outbreak occurred at Jhânsi, seventy miles distant to the S.S.E., and help was sought from Gwalior. The 4th Infantry Regiment volunteered for the service, and a wing was sent with a battery of artillery under the command of Captain (now General Sir John) Murray. But at Deborah, thirty miles from their destination, the terrible news was brought that every European in Jhânsi had been brutally massacred, so the party had to return. From this moment the men evinced a restless spirit, the artillery were in almost open mutiny, and the officers had the greatest difficulty in restraining the men from breaking out on the march.

The next morning, the 14th, was Sunday. There was service as usual and the Holy Communion was administered. He who administered it and several of those receiving it, did so, alas! for the last time. In the afternoon the mess-house and a bungalow in cantonments were burned down. But on this occasion the sepoy's of the 4th Regiment worked with good-humoured alacrity to extinguish the flames; and it was fondly hoped that it was the work of a few incendiaries. Soon after 8 P.M., it was reported that the artillery had loaded their guns without orders. On the officers proceeding to the spot the men explained that they had been alarmed by a report that a European regiment was about to attack them. The officers assured them to the contrary and returned to their homes satisfied in their own minds that their men were all right.

But when the nine o'clock gun fired there was a commotion, then bugling, then shots, and then a volley. The end had come.

We will not attempt to give full details of the murderous scenes that followed, which have been vividly described in the pages of Malleeson and elsewhere. Suffice it to say that six officers and the chaplain, six sergeants and pensioners, three women and three children, nineteen in all, were killed, chiefly by volleys of musketry directed against all those attempting to reach the regimental lines or cross the main road of the cantonments. Major Blake, commanding the 2nd Regiment, was shot as he reached the lines; but some of his men (by whom he was much beloved) placed him under a guard and sent for the regimental doctor, whom they brought safely to his side. Major Blake soon expired; whereupon the doctor was called upon to leave, and escorted to the river-side. One lady (Mrs. Stewart) fell while tending a wounded officer; her little boy was killed at the same time; her daughter was saved. Her husband (Captain Stewart of the artillery), attempting to reach his battery, fell, severely wounded, was nursed through the night by two of his men, but deliberately shot next day; whether by the same two men or others does not appear.

But it is fair to mention, that, though officers were pursued and shot down without mercy, the lives of women and children were generally spared; and even in regard to the treatment of their officers the sepoys of the Contingent generally were by no means of one mind. Four out of the seven infantry regiments, two out of the four batteries of artillery, and the two regiments of cavalry, excepting a party at Gwalior, allowed their officers to escape unharmed. Three men of the 2nd Regiment escorted a lieutenant—carrying his wife

in a litter—seven miles to the Residency. The guard of the 1st Regiment, in charge of the family of its absent commandant, behaved admirably, and both Captain Meade and Captain Murray and their families were, as will be seen, well served by a portion of the 4th Regiment.

Captain Meade's house was by the river—close to the bridge, and divided from the second of the two rows of bungalows and the regimental lines in rear of them by a broad road. At one corner of the garden was the cantonment treasury with a guard of fifty sepoy. At another corner, overlooking the river bed, was a circular guard-house, occupied by a non-commissioned native officer and ten men. In front of the house was another guard of the same regiment. So the garden swarmed with sepoy and was, in fact, the most dangerous centre in cantonments, and if the three guards had been like-minded, or the river in flood, none could have escaped. But the water was low, and it so happened that, while the guard in front of the house was mutinous and bloodthirsty, that in the guard-house by the river, was, for the time being, faithful, and saved the lives of Mrs. Meade, her sister, and their children.

The circumstances are thus described by Mrs. (now Lady) Murray¹ in a letter (written a few days after the occurrences):—

“We had tea as usual at 8 p.m. Richard² then

¹ A few additional details have been inserted from a letter by Mrs. Meade, written about the same time.

² Captain Meade.

went out and spoke to the *dhavildár*¹ in charge of the night watch and told him to take great care not to allow any suspicious-looking person to enter the compound.² The man replied: 'Yes, sahib, I will shoot all who go into the house and all who leave it'. Richard returned looking grave. Soon after this a sergeant reported that the artillery had loaded their guns. Captains Stewart and Hawkins went to their batteries and found their men, as they pretended, had been alarmed by some reports that a European regiment was on them. The officers assured them to the contrary and returned to their homes satisfied that their men were all right.

"After this the gentlemen went to lie down. Emily³ and I were just beginning to undress, when the nine o'clock gun fired. Immediately after this we heard a great noise in the direction of the lines. The bugling commenced, shots were heard, then a volley was fired. We ran and called the gentlemen, who were on the other side of the house. Richard told us to put out all lights, as the sepoys could see through the venetians into the rooms. A Chaprassie⁴ was immediately sent to warn some ladies who were at a distance that there was danger. The man was stopped at the gate by the guard of the treasury. An orderly was also sent off to the lines to find out the cause of the alarm, whilst the horses were being saddled to take the gentlemen to the lines; but these the sepoys would not allow to leave the stables.

"The orderly returned saying that some men of the 2nd had rushed into the lines of the 4th Regiment call-

¹ Native sergeant. ² Garden. ³ Mrs. Meade. ⁴ Messenger.

ing out that the Europeans were upon them (this seemed the watchword in many places), but, he added, all would soon be right. Scarcely a minute elapsed ere the noise recommenced and another bungalow was in flames.

"Richard and John" made up their minds to put us in some place of safety. We snatched the poor sleeping children from their beds, and all went out into the garden by the side-door of the bedroom, Richard going first, with his sword in his hand, as we did not know if the sepoy who guarded the door could be depended on. He however allowed Richard to lead him round the corner of the house whilst we all slipped past. It was all the work of a minute.

"We hastened to a building in the rear of the compound, where there was a guard composed of a havildár and ten sepoys. Providentially these men (at least for the time) were with us. The gentlemen asked the havildár to protect us, whilst they went to the Brigadier, who lived in the next compound.

"The havildár made us follow him up the stairs to the roof of the building. It was a small round tower about seven feet in height; he then told us to lie down; no sooner had he left us and returned to his men than the guard, who had been posted in front of our house, came to them, and we heard them ask him where the 'mem-sahibs and babas' had gone, as they missed them. The man replied he had not seen us. None of the babies had cried we should have been betrayed; but all were quiet. As soon as these traitors had turned their backs, the havildár made

signs to us that we could be seen from below, as E. and I, in our suspense and anxiety, were bending over the little parapet of the tower.

"Shortly after, to our great joy, John and Richard returned. We had been full of anxiety on their account, as the firing had been constant. They brought us down from our hiding-place, and told us that the Brigadier had ordered them not to go to the lines, as it was evident the men were beyond control; indeed whilst they were at the Brigadier's they had to retire from the front verandah to the back of the house as bullets were falling all around them.

"The havildár urged us to cross the river without delay, as the guards were already firing at other fugitives who were attempting to escape farther up the stream. He and three men actually escorted us over. Our bungalow was on the banks of the Morár River, but as the bridge was strongly guarded, we could not attempt to cross by it but were obliged to scramble down the steep banks and wade through the water, which fortunately was shallow. Just after crossing, E. and I fell into a ditch; she sprained her foot severely and had great difficulty in proceeding, carrying her heavy child in her arms.

"Here the havildár and his men said they must leave us and return to Morár."¹

¹ Captain Meade, after his return to Gwalior, tried to trace the havildár to whose fidelity he and his family owed their lives; but for some time without success. Several men claimed a reward; but, on examination, their claims were proved to be without foundation. At last, after a lapse of two years, Captain Meade received a letter from the superintendent of a jail in Oude, who informed him that one of the prisoners in his charge asserted that he had saved the lives of the families of Captains Meade and



THE MONK IN RAVIN,
with the Gossamer Patches in the distance.
(Taken & Sketch by Mrs. Dole.)

At length the sound of musketry, which had been more or less continuous, ceased, and Captain Murray, who had his charger with him, tried to return to cantonments by the bridge and see if anything could be done to restore order and bring the troops to reason; but it was held in force by the mutineers, his life was threatened, and he was compelled to retreat.

After wandering for some time amidst thorny fields (Mrs. Meade with a sprained foot), crouching down from time to time at every sound of footsteps, they saw another bungalow in flames, and, believing return to cantonments hopeless, and that there was no chance of safety at the Residency, decided to throw themselves on the protection of the Mahārāja.

At one o'clock on the morning of the 15th June, they reached the garden of Sindhia's country mansion (situate outside the Lashkar), known as the Phulbāgh Palace, and were delighted to hear from the Brigadier, who met them on the road, that Sindhia was willing to receive them.

"We were escorted," says Mrs. Murray, "through the palace gardens and taken up a steep flight of steps to a small turret, where His Highness, with a number of his sirdārs, was sitting on the ground by the light of a tall native lamp. It was a strange sight; the gardens full of His Highness's cavalry and artillery; the alarmed looks of the people, including the Mahārāja, who, when he heard the Political Agent was on his way to the palace, wrung his hands in despair. We rested

Murray during the mutiny at Gwalior. The man was sent to Gwalior and identified; and Captain Meade was thus enabled to make some return for the great service he had rendered in the hour of danger.

ourselves on some cushions, but, after some time, begged for some place to lie down in.' They took us to another part of the palace, gave us some 'tea and some bedding; but who could rest? At two o'clock A.M., to our great joy, more fugitives arrived; they told us every one else was murdered."

On hearing of the outbreak, Major Macpherson, the Political Agent, proceeded with his sister and an officer who had escaped from cantonments, to join the Mahārāja, escorted by a party of Marátha horsemen—some of Sindhia's body-guard. His carriage was stopped by a party of *gházis* or Muhammadan fanatics, who demanded the lives of the Agent and those with him; but the Marátha captain of the guard averred that he was taking the Agent as prisoner to Sindhia, so they were allowed to pass.

On arrival at the palace he was informed by the Mahārāja that the attitude of the mutineers and the feeling of his own troops had become so hostile that it would be impossible for him to protect the fugitives for any length of time. He urged, therefore, that the Political Agent and all who had escaped should leave as soon as possible for Agra, and undertook to provide carriages, palanquins, and an escort as far as the Chambal River. This was agreed to.

But, before leaving, Major Macpherson took occasion earnestly to impress upon the Mahārāja the importance of doing his best to detain the mutinous troops at Gwalior until the British Government was in a position to crush the rebels at Dehli.

The Mahārāja and his minister promised to do their best, and they kept their word.

At daybreak on the 15th a start was made, and as they passed the Residency, which lay on the road to Agra, more fugitives joined the party, which now included Major Macpherson (the Resident) and his sister, Brigadier-General Ramsay, Captain Meade (Brigade Major) and Mrs. Meade, Captain Murray (commanding the 4th Infantry Regiment of the Contingent) and Mrs. Murray (sister of Mrs. Meade), who had just buried one of their infant children, and others. At Hingona, twelve miles from the river Chambal, which separates Gwalior territory from the petty State of Dholpur, they were met by a party of religious fanatics headed by one Jahángír Khan, formerly a native officer of the Contingent, then a favourite captain of Sindhia's army, but now a *gházi* leader. "He appeared," says Major Macpherson, "arrayed in green, with beads fingered in ceaseless prayer," protesting that "he had no desire to injure them," but at the same time had a band of plunderers in the ravines fringing the river ready to attack them.

The Marátha escort refused to proceed beyond Hingona, and the party had to spend a night of discomfort in the carriages or on the grass, with far from pleasant anticipations for the morrow.

But deliverance was at hand. Soon after midnight the glitter of torches was seen in the distance, and a growing murmur of voices and the measured tread of an advancing force were heard. The hearts of many of the fugitives sank within them. But to their intense relief the advancing force proved to be the following of a friendly chief. It was the following of Thakor Baldeo Singh, chief of the Dandautia

Brahmans, a robust and warlike tribe, who had come with a strong body of his clansmen to defend them.

It appears that the minister, Dinkar Rao, anticipating difficulties at the river Chambal, had thoughtfully summoned the loyal Thakor to go to the rescue of the fugitives, and he promptly obeyed. The minister's policy of "dealing fairly with the subordinate races" had thus borne fruit.

On the farther bank of the Chambal elephants and an escort sent by the Rána (chief) of Dholpur, a small Ját State, also loyal to the British Government, awaited the fugitives. But in the ravines leading to the river a party of Jahángír's band had been posted and meant mischief. However Baldeo Singh got information of their presence, and, after placing some of his own men to watch the *gházi* leader, took the party to the river by another route and passed them safely over.

The Rána of Dholpur loaded the fugitives with kindness, and despatched them in carts, with a strong escort, a distance of six and thirty miles to Agra, where they arrived safely on the forenoon of the 17th.

Similar kindness was shown by both of the chiefs to two other parties of fugitives from Gwalior who came a few days later.

The services of Baldeo Singh and those of the Dholpur chief were not forgotten. The former received a grant of land in British territory; and a *jágír* or assignment of the revenues of certain villages from Sindhia; and 100 of his tribesmen, under the

command of Gopál Singh,¹ the chief's brother, were selected to form a troop in a cavalry regiment, subsequently raised by Captain Meade, and known during the mutiny as "Meade's Horse".

The latter received the honour of K.C.S.I.

¹ Gopál Singh had a distinguished career. He became Resaldar Major (principal native commissioned officer) of the Central India Horse, and did good service in Afghanistan in 1879-80, and, when he died, about three years ago, he was native A.D.C. to the Viceroy. "He was more than six feet high," says Major Meade, "and the most soldier-like man I ever saw."

CHAPTER V.

EVENTS AT AGRA AND GWALIOR.

Situation at Agra—Advance of the rebel force from Nímach and Nasírábád—Defection of the troops of friendly States—Disastrous fight at Sassiah—Part taken by Meade—Rising at Agra—Fall of Dehli—Greathed's column—Advance of rebels from Mhau and Indore—Greathed's column reaches Agra—Attacked by rebels—Rebels defeated with loss—Meade raises a regiment of native cavalry—Its services—Rebel forces driven from Kalpi approach Gwalior—Sindhia attacks them—His troops join the enemy—Sindhia flies to Agra—Gwalior occupied by rebels.

WHEN the fugitives reached Agra, as described in the last chapter, their troubles were over for the time. The native regiments of the garrison had been disarmed and disbanded; the cavalry regiment and battery of the Gwalior Contingent, which had been despatched by Sindhia to Agra on the Lieut.-Governor's requisition—a force from which danger might have been apprehended—had been sent away from the capital to keep order in the district of Aligarh,¹ while, thanks to the efforts of the Mahárája and his minister, who were in daily communication with Major Macpherson at Agra, the mutinous regiments of Gwalior were detained there for the present. The old Mughal fort of Agra was held by an English

¹ The regiment soon afterwards mutinied but the men did not shoot down their officers, who escaped to Agra.

regiment and battery, and the station was further protected by a force of English and Eurasian volunteers, a portion of the Contingent of the Rájá of Kotah (a friendly Rájput State)—a force officered by Englishmen—some cavalry furnished by the State of Bhartpur, and 600 matchlock men from Karauli (another Rájput State), commanded by Saifullah Khan, a Muhammadan gentleman of influence.

But the surrounding country was in a very disturbed condition. The police sympathised with the mutineers; law and order had disappeared and there were rumours of an advance by a strong body of rebels from Nímach and Nasírábád.

The truth of these rumours was soon confirmed, and, at the end of June, the Christian residents of the city and station, with a few exceptions, took refuge in the fort.

On the 4th July, the Kotah Contingent mutinied and joined the enemy; the Karauli levies refused to fight and were sent home; the Bhartpur cavalry deserted.

On the 5th July, the enemy now amounting to 4000 infantry, 1500 cavalry, with eleven guns, reached Sassiah, a village five miles off, and Brigadier Polwhele, commanding at Agra, decided to attack them with the small force at his disposal,—namely, one English regiment and battery and about fifty volunteers, in all a force of about 700 men and six guns.

After a long artillery engagement, during which the British force expended an enormous amount of ammunition, but suffered more than the enemy, an attack was delivered and the village of Sassiah carried;

but by this time the ammunition was exhausted and our troops had to retire, harassed by the enemy and suffering considerable loss.

Captain Meade took part in the action as a volunteer, and during the retreat was in considerable danger, as he remained behind with some others vainly endeavouring to extricate and remove a gun which had become embedded in mud. The gun had to be left on the field, but was not carried off by the enemy.

The enemy did not follow up their success by an attack on Agra and moved on to Dehli; but the ruffians of the city and the adjoining villages, joined by many of the police and the prisoners from the jail, rose *en masse*, and for two days the station was given up to pillage; bungalows were burnt, property carried off, and upwards of twenty Christians, European and native, lost their lives.

Order was at length restored at Agra and measures taken for relieving Aligarh, but the surrounding population was still far from friendly.

However on the 15th of September Dehli was successfully assaulted, and, after a struggle of some days, entirely recaptured—an event which had, of course, an important effect in pacifying the surrounding country and allaying the growing excitement in the Punjab as well as the North-Western Provinces.

A few days after the recapture of Dehli a column under the command of Lieut.-Colonel Greathed was despatched to clear the road between Dehli and Cawnpore.

While Greathed's force is on the march let us

glance for a moment at the affairs of Gwalior. We have seen how the Mahárāja, by the advice of his minister Dinkar Rao, and in communication with the Political Agent, had succeeded in restraining the mutinous Contingent regiments from proceeding to attack Agra, or joining their brethren at Dehli.

But soon a new danger appeared. On the 31st July there arrived at Gwalior a formidable rebel force from Mhau and Indore, comprising not only the mutinous regiments of those stations, but 600 men of Holkar's army, with seven guns and 1000 fanatics led by a person styling himself Firoz Shah, Prince of Dehli, and also the 5th Contingent Infantry Regiment which joined it *en route*. After vainly endeavouring to detain this force at Gwalior the Mahárāja was constrained to allow it to proceed to Agra, and, accordingly, between the 5th and 7th September they crossed the Chambal.

On hearing of the approach of this rebel force the Agra authorities applied for assistance to Greathed's column, which, accordingly, turned aside from the direct route to Cawnpore, and marched into Agra early on the morning of the 10th October.

Of what followed we have a graphic narrative from the pen of F.M. Lord Roberts. While the wayworn British troops were settling down in camp they were suddenly attacked by the rebel force and a desperate conflict ensued. But after much hand-to-hand fighting, grand practice by the artillery, and splendid charges from the cavalry, English and Indian, the enemy were beaten off and promptly pursued and dispersed, and their camp taken with thirteen guns and a great quantity of ammunition.

The Agra garrison seeing the attack hastened from the fort to assist the Dehli column and, arrived just as the enemy had been defeated; but they were in time to take part in the pursuit of the retreating foe. Captain Meade was with the Agra force, but has left no detailed account of his services on the occasion.

To return to Gwalior: after the departure of the Mhau and Indore rebels for Agra the Contingent became more and more unmanageable, and at length the bulk of the force, seduced by emissaries from the Nána Sáhib, marched from Gwalior, under the command of Tantia Topi, now the Nána's chief agent,—not however for Agra, but for Bundelkhand and Cawnpore. Before leaving they destroyed the cantonments at Morár and, as they proceeded, laid waste Sindhia's territory, declaring that he was the enemy of their cause. The Contingent left on the 15th October, and between that date and the following May; with the exception of some local disturbances, the peace of Gwalior was fairly maintained by the Maharája and his officials.

Meanwhile we have to record the proceedings of Captain Meade at Agra. After having remained five months in the unsatisfactory position of "doing duty officer," that is an officer available for any kind of service required, but with no definite military duty assigned to him, he had the gratification of receiving, at the end of November, instructions from the Government of India to raise a regiment of native cavalry for general service.

He set to work at once *con amore*, but the task was somewhat arduous, for trustworthy recruits were not to be had in the vicinity, while those whose loyalty was satisfactory were, as a rule, entirely innocent of the art of riding. However by dint of incessant labour and his personal popularity with native races he was able, in a little more than two months' time, to get together and prepare for service a cavalry regiment nearly 600 strong. It was what is technically known as a "class" regiment, that is a regiment in which each troop is composed of men of distinctive castes or nationalities. Thus of the six troops composing Meade's regiment one troop consisted of Sikhs, another of Punjābi Muhammadans, another of Jāts, another of native Christians; the fifth was a troop of Gwalior men under the command of Gopāl Singh, brother of the loyal Thakor Baldeo Singh, who had befriended the fugitives at the river Chambal, and the sixth a troop of mixed races. The regiment was under the command of Captain Meade with six English officers selected by himself, and when inspected by Brigadier-General Showers in March, 1858, was declared to be "as fine a body of native cavalry as he had ever seen".

Between January and June, 1858, Meade's Horse, as the regiment was designated, was constantly employed in maintaining order in the Agra district. In June it took part in the actions near Gwalior, including the brilliant attack on the retreating rebel force on 21st June, 1858, then joined Sir Robert Napier's Field Force and was engaged in the operations against Rāja Mán Singh; the capture of Pauri, and the action at Bījapur, earning for its services the

special acknowledgments of the Government of India.¹ It was unceasingly employed in 1858-59 on the west and south of Gwalior, and shared in the operations resulting in the surrender of Rájá Mán Singh and the capture of Tantia Topi. A portion of the regiment was in the fight at Garroya, which closed the rebellion in Gwalior, and the entire regiment was more or less actively employed in Málwa until 1861, when it was incorporated with the Central India Horse.

But we are somewhat anticipating events and must again return to Gwalior.

The Mhau and Indore rebels had, as we have seen, passed through Gwalior and been disposed of, and the Contingent had left for Cawnpore; but now Sindhia's own army, 10,000 strong, and composed of races more or less in sympathy with our own sepoy and corrupted by Marátha emissaries, began to get out of hand. At this juncture Kálpi, on the Jamṇa, the last stronghold of the rebel forces in Central India, was taken by Sir Hugh Rose, and the occupants fled in 'disorder across the river Chambal. Informed, however, of the state of Sindhia's army they suddenly rallied, recrossed the river and advanced on Gwalior. Their leaders were the Rao Sáhíb, connected by adoption with the

¹ "His Lordship [Lord Canning] is well aware of the indefatigable manner in which you and your men have performed your duties in the neighbourhood of Agra, and of the good services which you have rendered, and for which the Governor-General feels desirous now to offer you his acknowledgments."
—From Secretary to the Government of India to Captain Meade, 28th September, 1858.

Nána, Tantia Topi, "the soul of the Nána's cause," and believed to be one of his chief agents in the massacres of Cawnpore, the once friendly, but now rebellious, Nawáb of Bánda, who had just been defeated by General Whitelock, but had still a force of serviceable cavalry; and lastly the brave, but blood-thirsty, Ráni of Jhánsi, a determined foe of the British Government, and authoress of a massacre of men, women and children as revolting and deliberate as that of Cawnpore; she is described by some as the "Joan of Arc" of India, but by Major Macpherson "as an ardent, daring, licentious woman, under thirty, who rode in male military attire with sword and pistols, and had as her A.D.C. a Brahminee concubine of her late husband".¹

On the 29th May, the invading force arrived within eight miles of Gwalior. On the morning of the 31st, Sindhia moved to Bahádurpur to attack them with 8000 men and twenty-four guns. After a brief show of fighting, on the morning of the 1st June Sindhia's troops fraternised with the rebels, and the Maharája, attended only by his minister and a very few adherents, fled to Agra, where he was received with the greatest honour and sympathy. Gwalior was occupied by the rebels, who looted the treasury and jewels; the palace, the fort and arsenal

¹ The Ráni of Jhánsi was widow of the chief of a petty *rāj* or principality in Bundelkhand, which had been created by the British Government in 1832, but resumed in default of heirs in 1854 in accordance with the views of Sir W. Metcalfe and Colonel (afterwards Sir) R. Low—both warm supporters of native dynasties—and the practice of the East India Company in previous cases of similar character.

came into their hands. "And thus," says Sir Owen Burne, "the rebels who had fled a disorderly and helpless mob from Kálpi now found themselves provided with abundance of money, with material of war and with Sindhia's army as their allies." Their leader, the Rao Sáhí, appointed Tantia Topi commander-in-chief of the rebel forces, and, anxious to secure the sympathy of the inhabitants, peremptorily forbade all indiscriminate plundering, and confirmed nearly all Sindhia's officers in their posts. The Residency and the palace in the Phúlbagh, where the fugitives had obtained shelter, were destroyed, and the Ránis with the chief nobles of the State, including Sindhia's queen and his adoptive mother the Baiza Bai, and a small Marátha guard, fled to the fort of Narwar thirty miles off. The Baiza Bai, who had the reputation of being hostile to the British Government, received from the Rao Sáhí an offer to be placed in charge of affairs at Gwalior, but she rejected his overtures, sent on his letters to the Governor-General's Agent for Central India, and, on the arrival of Sir H. Rose before Gwalior, joined his camp at Morár.

But the success of the rebels was shortlived, as will be seen in the next chapter.

CHAPTER VI.

THE RECAPTURE OF GWALIOR.

Sir H. Rose moves from Kálpi on 5th June—His force—Morár occupied—Advance of Smith's brigade from Sípri—Sweeps the hills and captures the Phúlbágh batteries, but has to retire—Death of the Ráni of Jhánsi—Sindhia summoned to the camp—Meade appointed to escort him—Reaches Morár on the 18th—Sir H. Rose decides to join his force with Smith's and takes Meade with him—Fighting on the 19th; Meade having reconnoitred enemy's position, Sir H. Rose storms the heights—Enemy driven off and all its guns (26) captured, and rebel force in the plain driven into the Lashkar—General decides to advance at once through the Lashkar to the palace—Meade acts as guide, and, on arrival at the palace, enters the courtyard alone and induces the holders to surrender without bloodshed—On the 20th Sindhia received by Sir H. Rose at the head of his troops, and conducted to his palace—Meade leaves to join the pursuing column—Just too late for the victory of the 21st—No mention of Meade's special service in procuring surrender of the palace contained in Sir H. Rose's despatch—Meade vainly attempts to get the omission rectified—Remarkable speech by Sindhia.

AFTER the flight of the rebel forces from Kálpi a pursuing column was organised, but the General, sorely requiring rest, obtained leave to return to Bombay, and the command was given to Brigadier-General Sir R. Napier (afterwards Lord Napier of Magdala). But on the news of the occupation of Gwalior and the flight of Sindhia reaching him, Sir Hugh Rose at once offered to cancel his leave and take command of the avenging force. His offer was accepted, and

at the same time General Napier generously agreed to act as his second in command.

The force consisted of a portion of the garrison of Kálpi, a column under Brigadier Stuart, the Hyderabad Contingent, and the Rajputána Field Force under Brigadier Smith.

At six in the morning of the 16th June the force from Kálpi reached Bahádurpur, the scene of Sindhia's defeat, and then pushed on to Morár (the cantonment of the Contingent), which was held by the enemy. After a sharp action, in which the 71st Highlanders greatly distinguished themselves, the enemy was driven out with loss, closely pursued by a wing of the 14th Light Dragoons.

Brigadier Smith, whose force was at Kotha-ki-Sarai, was then directed to advance on Gwalior from the east. He did so on the 17th, and the operations are thus described by Major Macpherson :—

“ Between Kotha-ki-Sarai and Gwalior lies a chain of low hills a mile broad ; and through a defile in these runs the Jhánsi Road, flanked on the westward by a canal impassable for guns or horses except by a bridge just burnt by the rebels. To oppose Smith, the rebels had planted guns at six points upon the summits of the hills on either side of the defile, supporting them by a numerous infantry. Beyond the hills towards Gwalior, in the plain which spreads between it and Morár, were two batteries of six and five guns, near the Phúlbaugh Palace, under Tantia Topi, while two eighteen pounders were placed in the plain to the left, and many guns at other points.

“ Smith swept the hills with the 95th Foot and 10th Bombay N.I., while his guns and a wing of the

8th Hussars and Bombay Lancers advanced by the defile. The hills passed, the cavalry charged straight into the plain, which was held by some 1500 horse, and immediately carried the two Phúlbagh batteries. But it was evening, and the troops had not breakfasted. Of the 95th alone, from hunger and extreme fatigue and exposure in sweeping the hills, four officers and eighty-five men were disabled by sunstroke. The force, therefore, necessarily retired within the defile, securing four of the captured guns."

This action is memorable for the death of the Ráni of Jhánsi, who was mortally wounded in a gallant charge by a squadron of the 8th Hussars. "She was seated near the Phúlbagh batteries drinking sherbet, when the alarm was given that the Hussars approached." The Ráni—clad in a red jacket and trousers and white turban, and wearing a pearl necklace just looted from Sindhia's treasury—mounted her horse, and, attended by her ever-faithful A.D.C., tried to avoid the charge by leaping the canal. But her horse refused. Meanwhile the Hussars, led by Captain Heneage, swept by. The Ráni received a shot in the side and a sabre cut on the head, but rode off. Soon afterwards she fell, was moved into a tent and died, and her remains were burnt with much ceremony in a garden close by.¹ The

¹ Her faithful A.D.C. (the Brahminee concubine of her late husband) received a sabre wound at the same time, but was able to ride into the city. Here she was tended by a fakír and a Muhammadan official, and dying in their hands was treated as a convert to Islám and *buried*! It is said that the Ráni, when dying, begged that the ornaments on her person, which were very valuable, might be distributed among her troops, for whose services she expressed the deepest gratitude.

Ráni's death greatly dispirited the rebel army. She was undoubtedly the bravest and best military leader they had.

Meanwhile Sindhia had been summoned from Agra, and his consort (the Maharáni) and his adoptive mother (the Baiza Bai) from the fort of Narwar (where they had taken refuge), to make it evident that our advance from Gwalior was undertaken with a view of reinstating the dynasty in accordance with treaty engagements, and not for purposes of annexation.

The duty of escorting Sindhia back to his capital was entrusted to Captain Meade. They left Agra on the 13th of June, accompanied by two squadrons of Meade's Horse, and by forced marches reached Sir Hugh Rose's camp at Morár, on the 18th. The Ránis reached the camp next day.

At 5 P.M. on the 18th the General proceeded to join his force with that of Brigadier Smith, who held a portion of the heights commanding Gwalior, but was hard pressed by the enemy, who occupied the remaining portion. He was accompanied (as acting A.D.C.) by Captain Meade, whose knowledge of the locality rendered him of the greatest use during the ensuing operations.

After a particularly harassing march Sir Hugh Rose reached his destination early in the morning of the 19th and placed his guns in position, but the enemy's fire was heavy and the General was anxious to dislodge them. He therefore sent Captain Meade to reconnoitre and ascertain the best point of attack. Captain Meade performed the duty, and at midday the troops crossed the canal (which had been tem-

porarily bridged) and advanced to storm the heights. This was done successfully, after four hours' hard work; all the enemy's guns, twenty-six in number, and magazines were taken, and the rebels were in full retreat. Meanwhile the horse artillery opened fire upon a mass of the enemy (some 10,000 strong, with numerous cavalry) drawn up on the parade ground. They fled into the Lashkar or military quarter of the town, in the direction of the Mahárája's palace, while the British cavalry swept the plain.

Sir Hugh Rose had, at first, intended to bivouac for the night upon the plain, and attack the town next morning, in conjunction with Sir Robert Napier's force from Morár, and that of Brigadier Smith, who had been directed meanwhile to attack and capture the Phúlbagh batteries. But encouraged by his success he determined, in consultation with Meade, who volunteered to act as guide, to push forward at once through the Lashkar to the palace, which it was proposed, if necessary, to storm.

This was a particularly hazardous proceeding, as the Lashkar was presumably full of armed men with not a few fanatical Mewattis, while the streets were long and narrow, but Sir Hugh Rose was bold to rashness, and placed himself at the head of the column with Captain Meade at his side, and advanced—each officer having his pistol at full-cock in his hand. Some twenty or thirty of the enemy were killed *en route*, but the column threaded its way through the interminable streets, and at length arrived without a casualty at the open space in front of the palace, which seemed full of armed men and ruffians in a state of wild excitement. —

We have now to describe an act of service performed by Captain Meade which, owing to various circumstances, has obtained little official recognition; though it was one which, besides involving great personal risk, had the effect of saving much life and property and earning the lasting gratitude of the Maharája. It can best be described in Captain Meade's own words:—

“On the head of the column reaching the end of the street which debouches on the open space around the palace enclosure, and coming within sight of the latter, we found that the courtyard and building were occupied by a large number of armed men, whose intentions we, of course, had at the moment no means of knowing.

“The approach to the palace block was entirely commanded by its upper storeyed buildings, which are of substantial masonry with terraced roofs screened by a parapet, and under the feeling that any attempt to storm these buildings must be attended with heavy loss—especially if the occupants included, as I thought probable, some of the Mewattis and other desperadoes of the Lashkar—and that, if possible, Sindhia's palace ought to be preserved from such a fate, I volunteered to ride forward alone, and to endeavour to obtain the surrender of the place to the British force.

“The general assented, and by his orders the column halted while I rode up to the gateway which formed the entrance to the courtyard. There was no gate, but I found all ingress through the gateway barred to a horseman by a beam of wood which was fixed in a socket in the wall on either side, and for some minutes, while I was detained by this barrier,

my life was certainly in the most imminent peril, for several muskets were levelled at me, and a single shot from the Europeans in the rear would have ensured my destruction. The people inside were in the wildest confusion, and I gathered that some of them were determined to resist our troops.

“The delay in getting inside the courtyard was most embarrassing, for I felt that every moment was precious; but such was the confusion that I could not for some time get any one’s attention, beyond menaces of the nature already stated. At length, to my great relief, a little wizened Mussulman, who was close to the gateway, recognised me, and shouted out three or four times, ‘This is Meade Sahib,’ and hearing this, three or four men at last complied with my repeated demand to remove the barrier, and I dashed into the courtyard, up to a group of some five or six men whom I had previously noticed as being evidently the leaders of the party. Taking one of these—a tall powerful man, who appeared to be the chief, and who I afterwards learnt was one of the palace *mujras* (or attendants), who, with his companions generally, had joined the rebels—by the shoulder, I told them I would save their lives if they would obey my orders, but that there must be no delay, as the British force outside was prepared and eager to attack them. After a moment’s consultation, they said they would hold the palace for the Maharája and would give it up to him on his coming to it, but that they would not surrender it to the English. I replied that this was impossible, that the Chief was away at Morár, and that the palace must be at once given up, or it would be stormed forthwith, in which event not a man of them would escape. They again

short distance down the main street, and told some of the bankers, who had up to that moment been trembling in their houses, that the Lashkar had been cleared of the enemy, and that the palace was in the occupation of the British force, and I called on them to come and pay their respects to the General.

"Numbers of them at once repaired to the gateway, where Sir Hugh Rose was seated, and in a short time the street was full of well-dressed men of this class, all vociferating their gratitude for the expulsion of the rebels and their release from the terror under which they had been labouring during the period (nearly three weeks) of their occupation of the city. Some champagne and brandy were produced from one of the palace storehouses, and those who had the fortune to get a share of the same thoroughly enjoyed the grateful liquids.

"After a halt of about an hour, during which arrangements were made for the security of the palace, and also of the main streets, the force moved back to the camp, and I proceeded by the General's order to the Phúlábágh to ascertain the state of affairs there."

Captain Meade found that the Phúlábágh had been gallantly captured by the force under Brigadier Smith, with trifling loss to ourselves and great loss to the enemy; and during the night the fortress of Gwalior was evacuated.

Next morning Sindhia, accompanied by Sir Robert Hamilton, Agent to the Governor-General for Central India, proceeded from the Morár cantonments and was received by Sir Hugh Rose at the head of his

spoke together, and the tall man at last said : ' We will do what you order '.

" There were a large number of men at the time in the courtyard, and also inside and on the roofs of the building, and as it struck me that the great object at the moment was to get them out of sight, so as to avoid the chance of any firing between them and our troops, which might have led to a serious struggle, I directed every man to get at once inside the building, and to remain there perfectly quiet till they had permission to leave, or orders were issued for their disposal. This was effected, after a little difficulty, by the urgent efforts of the leaders and those who seemed amenable to their authority, and in a short time I was left alone in the courtyard with only three or four of these men with me.

" I then told the tall man that he and his fellow-leaders would be held responsible for the conduct of the men who were with them, and for the preservation of the interior of the palace buildings, so long as they remained in the latter ; and then, after a few words of earnest warning to them, I rode back to report the result to the General, and begged that I might have a party of Europeans and sepoys to post for the due security of the place. A company each of the 95th Foot and 25th Bombay N.I. were ordered forward with me for this purpose, and I placed the sepoys inside the courtyard, posting sentries from them over the treasury entrance and at some other points, and the Europeans in and outside the gateway.

" In the meantime the column was moved up into the open space outside the enclosure, and there piled arms ; and I then, at Sir Hugh Rose's request, went a

Gwalior, and he was of course anxious to be with it. He did his best to join the pursuing column, but unfortunately arrived just too late to take part in the brilliant engagement of the 21st, when Sir Robert Napier with one troop of Horse Artillery and 500 cavalry, including two squadrons of Meade's Horse, attacked and completely routed the enemy, 10,000 strong, with twenty-six guns, all of which were captured.

Thus Gwalior was reoccupied—to the unbounded gratitude of the people and high credit of the troops engaged—with marvellous rapidity and comparatively trifling loss to us.

Its speedy recapture and the prompt reinstatement of our ally as Ruling Chief caused a profound sensation throughout India. A royal salute was fired in every large town, and in recognition of his brilliant services, worthily crowned by this last exploit, the General received the honour of G.C.B., the colonelcy of the 45th Regiment and a vote of thanks from both Houses of Parliament.

But it will be generally admitted that for the last success, and especially for the occupation of the palace without bloodshed or destruction of property, no small share of credit was due to the subject of this memoir; for, without his local knowledge, it would have been impossible to follow up the victory of the 19th by the immediate capture of the palace; and it would not have been possible to occupy the palace without bloodshed but for the bold and judicious action of Captain Meade, and the friendly feelings entertained towards him by some of its armed occupants.

His services were warmly acknowledged at the time by the General commanding, who spoke, in similar terms regarding them to the Political Officers present,—Sir Robert Hamilton and Major Macpherson. Captain Meade was heartily congratulated by those present, and was the hero of the hour.

In these circumstances he not unnaturally expected that some mention of the special service he had thus rendered would be made in the official despatch. But he was disappointed. No despatch appeared for nine months, and when it did appear there was no reference made to his action in obtaining possession of the palace. He was thanked, indeed, in general terms, for his “zeal and knowledge of the locality,” but his cool daring in entering the palace when full of excited soldiery and arranging for its peaceable surrender was totally ignored;¹ while the only military reward conferred upon him was a brevet majority which antedated his promotion for a few months only.

Meade was surprised and disappointed, but though strongly urged by his friends to make a respectful representation of his claims, he thought such action would be indecorous and remained silent.

But in the year 1867, when the Viceroy—then Sir John Lawrence—was visiting Sindhia at Gwalior,

¹ The words of the despatch are: “Captain Meade volunteered to accompany me as acting A.D.C. His zeal and knowledge of the country rendered him of great use to me during the operations.” In the list of meritorious officers appended to the despatch his name is entered thus: “Captain Meade, commanding Meade’s Horse (special mention), good service, acting on my staff and giving me important local information”.

the story of Meade's having saved the palace was recounted to His Excellency by the Chief himself. His Excellency was much interested and expressed the opinion that so signal a service should be placed upon official record.

Thus encouraged, Lieut.-Colonel Meade (he had obtained this rank in 1866) at length yielded to his friends' advice, and, while on furlough in 1869, placed himself in communication personally and by letter with Lord Strathnairn (formerly Sir Hugh Rose), recalled the occasion to his lordship's memory, and prayed his assistance in securing the official record desired by the Viceroy. But his lordship, whose recollection of these events was imperfect and inaccurate, did not see his way to comply with Meade's request.¹

Meade then applied to the Commander-in-Chief in India (Lord Sandhurst) for permission to include a statement of the Gwalior palace incident in the official record of his services. His application was supported (it is said) by the Commander-in-Chief, and the papers were sent on to the Government of India; but these

¹ That his Lordship's recollection of these events should be imperfect is no matter for surprise. Eleven years had elapsed since they occurred, and when they occurred he was suffering from the effects of repeated sunstrokes,—a condition not favourable to retentiveness of memory. But Major-General Sir Owen Burne in his memoir of Lord Strathnairn (last edition) has added the following footnote regarding the capture of the Gwalior palace: "This was effected without bloodshed through the useful interposition of Captain (now Sir Richard) Meade. He happened to be well known to the Gwalior men, and gallantly volunteered to go forward alone to the palace courtyard, which was full of armed and excited soldiery, to persuade them to submit peaceably, and to give up the palace. They fortunately recognised him, and after some delay, acted on his advice."

were unfortunately mislaid or lost, and no order was passed on his application.

But Sindhia's gratitude was pronounced and lasting, and in 1872, at a public banquet given by the Maharája when Lord Northbrook visited Bombay, His Highness, in returning thanks after his health had been proposed, used the following remarkable words, which will fitly close the present chapter :—

“ There were three things,” His Highness said, “ for which he would ever be grateful to the British Government. The first was that the British Government had re-established his power in 1844, after the battles of Maharájpur and Panniar; the second was that the British Government had saved him and his State in the Mutiny; and the third was that Meade Sahib had saved his palace when occupied by rebels who were being driven before our troops.”

CHAPTER VII.

RESTORATION OF ORDER IN GWALIOR—SURRENDER OF MÁN SINGH—CAPTURE AND EXECUTION OF TANTIA TOPI.

State of Gwalior—Measures taken to restore order—Major Meade appointed on a commission to inquire into the conduct of the troops—Carries it out with justice and efficiency and earns the thanks of the Government of India and Secretary of State—Brigadier-General Napier takes in hand the disaffected portion of Gwalior territory, where Rája Mán Singh had influence—Mán Singh seizes the fort of Pauri, which is promptly attacked and taken by Napier, but Mán Singh escapes and is joined by Tantia Topi—Meade, having completed his inquiry, joins Napier's force, and is placed in command of a detachment—Captures and executes Tantia Topi—Statement by the latter before trial—His conduct and bearing after sentence—Tantia's prompt execution has a most salutary effect—Congratulations by Sir R. Hamilton, General Napier, Sir Hugh Rose and the Government of India—Verses in honour of the occasion by an English sergeant—Meade successfully attacks and disperses a rebel gathering at Garroya, thus ending the campaign in this part of India, and receives the thanks of Government.

THOUGH Sindhia had been triumphantly reinstated by the British Government, in the manner described in the preceding chapter, a good deal more remained to be done before his authority could be said to be completely re-established.

The capital itself was still crowded with rebels and a centre of disaffection and intrigue.

Of the army (regular and irregular) located at the capital and numbering nearly 13,000 men, only about

1200 had remained faithful ; of the rest, some 1500 had left with Tantia Topi's force, and about 9000 were either in hiding in the city or Lashkar, or harboured in the surrounding villages.

In the territory outside the capital, the local chiefs, thanks to their generous treatment by Dinkar Rao, had, for the most part, continued loyal, but there was a tract of country to the south of Gwalior, west of the main road from Gwalior to Indore, where the population was still hostile. The territory included the old domains of two Rájput chiefships, that of Narwar, an ancient town and fortress on the Sindh River, and Sheopur, on the western border, which had been conquered and, in part, confiscated by Daulat Rao Sindhia some fifty years previously ; but the representatives of the conquered chiefs, namely, Rája Mán Singh, descendant of the chiefs of Narwar, and Rája Balwant Singh of Sheopur, still possessed much influence in the locality and seized the opportunity of attempting to recover their lost possessions. The territories remaining to the latter were considerable, covering about 158 square miles. Rája Mán Singh resided at Paron, not far from Gúnah, where he held a *jágír* which had been assigned to his uncle in 1818 on the mediation of the British Government. The *jágír* was small in extent, but the character of the country, a hilly plateau intersected with ravines, with valleys difficult of access and covered in parts with patches of dense jungle, made it a convenient rendezvous and hiding-place for rebels and their followers.

In these circumstances, three important measures called for immediate attention :—

1. To restore and maintain order in Gwalior.
2. To deal with the rebellious army ; disarming and discharging the untrustworthy, and punishing ring-leaders and murderers.
3. To bring under control the disaffected tract above described.

With regard to the first and second of the three measures Sindhia was disposed at first to purchase present peace by compromising with the rebel soldiery in a manner not uncommon in Asiatic States, for he shrank from the trouble and also the unpopularity of an investigation in which many of his former boon companions would be involved. But it was pointed out to him that, while indiscriminate severity should be avoided, mutiny and rebellion were crimes too dangerous to be passed over with impunity. Sindhia at length yielded, and, on the suggestion of the Political Agent and the advice of the minister, he agreed to entrust Major Meade with the duty of maintaining order in the capital, and to appoint him, in conjunction with Bulwant Rao, the late Commander-in-Chief, on a commission of inquiry into the conduct of the troops.

Both these measures were most efficiently performed, and the latter was of a specially onerous character ; for the cases of upwards of 12,000 soldiers had to be inquired into, of whom between 5000 and 6000 actually appeared before the commission.

The inquiry, which lasted until the end of the year, was conducted by Major Meade with patience and impartiality, and the punishments awarded were

moderate and discriminating. Of the delinquents, four only were executed; some 120 were awarded terms of imprisonment; a few were released on security. The rest of the faithless portion of the army were disbanded, and 4732 stand of arms and 1000 cavalry horses were recovered for the State. Meanwhile, in spite of the hostile movements of Tantia Topi in the vicinity of Gwalior territory, the soldiery, having confidence in the fairness of the commission, remained quiescent.

"From first to last," wrote Sir Richmond Shakespear, "throughout all the details of this difficult and delicate duty, Major Meade has not only carried the Mahārāja with him, but has so arranged that His Highness should openly appear as superintending every step in the proceeding.

"The turbulent populace of the city of Gwalior has seen this considerable band of mutineers disarmed by the Mahārāja with all the order and formality which characterised our disarming operations in 1844, after the battle of Maharājpur. The moral effect has been immense; there is not an enemy of ours who does not feel that had rebellion not received its death-blow this body of mutineers would never have marched here to be disarmed; if a hope of successful rebellion still lingered in the minds of the disaffected it must have been obliterated by this notable triumph of order and assertion of authority.

"Major Meade gives the credit to the Mahārāja, but it is my pleasing duty to point out that, admirable as His Highness's conduct has been, it has been mainly caused by Major Meade's tact and judgment."

The Governor-General in Council highly commended the "tact and judgment" displayed by "Major

Meade in this difficult matter," and the Secretary of State endorsed the commendation.

The third measure—that of bringing under control the disaffected portion of Sindhia's territory—was taken in hand by the British General commanding in Gwalior, Sir Robert Napier; and in its execution he had in Meade's Horse a most serviceable corps.

On 2nd August, 1858, while Meade was closely engaged on the work of the commission, Mán Singh summoning his followers—12,000 strong, including the men of Sheopur—seized Sindhia's strong fort of Pauri, eighteen miles north-west of Sípri.

It was promptly attacked by forces from Sípri and Gwalior under Sir Robert Napier, and, after a brief bombardment, evacuated. Part of the retreating garrison, under Mán Singh's uncle, Ajít Singh, was caught and severely cut up; but both Mán Singh and Ajít Singh escaped. The chief of Sheopur surrendered to the Political Agent, but Mán Singh and his uncle remained at large in the difficult country surrounding the Rája's *jágir*; and the former was there joined by no less a personage than the arch-rebel and reputed murderer, Tantia Topi, who, notwithstanding his crushing defeat on the 21st June, had resumed active operations as a guerilla leader, and, after harassing Central India for well-nigh a year, was fairly run to earth in the jungle of Paron.

Tantia's adventurous career has been fully described in Colonel Malleson's pages and need not be detailed here. Suffice it to say that, though no less than five columns were on his track, he was able for a period of

nine months successfully to 'evade capture; while he kept all the territory surrounding Gwalior on the west and south and east in a state of terror and unrest.

His troops had numerous collisions with detachments of British troops and were invariably defeated. But he was undismayed by defeat, and turned up in some fresh locality, keeping up the spirit of his followers by plundering some petty chief *en route*. Thus after his defeat at Jaura Alipur on the 21st June he proceeded rapidly to Tonk, defeated the Nawáb, and carried off spoil and guns. After being defeated by General Roberts at Bhílwára and on the Banás River in Jaipur territory he crossed the Chambal and moved to Jhála Patan, where he levied a heavy contribution. Having possessed himself of the Rája's guns—thirty in number—he conceived the bold idea of marching on Indore in hopes of inducing Holkar's disaffected troops to join him. On the road he was attacked by General Michel's column at Rájgarh and utterly defeated, again losing all his guns.

But he obtained four fresh guns at Saronj and proceeded against Isagarh, a small fort in Sindhia's territory, which he stormed and plundered, obtaining seven fresh guns. He was again found and defeated by Michel. Again defeated at Mangrauli, he was joined by the Rao Sáhib's force at Lalitpur, then retreated southwards towards the Narbadda River. On the road he was attacked by Michel at Kurai and lost half his following; but he succeeded in crossing the Narbadda into the recently annexed territory of Nágpur, in the expectation of raising the country in his favour.

But six years' experience of British rule had pro-

duced a marked change in the feelings of the Marátha peasantry. They received Tantia and his followers not merely without enthusiasm, but with antipathy; not only declining to join his standard, but refusing him supplies.

Foiled in his hopes of aid in Nágpur, he recrossed the river, close pressed by British troops, and moved rapidly, in a westerly direction, towards Baroda, the seat of a Marátha dynasty where he had many sympathisers and hoped to obtain a more favourable reception. But he was caught by a force under Colonel Parke at Chota Udaipur, and again completely routed.

His position was now well-nigh desperate. His pursuers closed around him and the end seemed near; but he rallied his followers and rapidly moving to the north escaped their clutches, and was joined by a force under the pseudo-prince, Firoz Shah; he then tried to break through the pursuing columns on the north-west, but was caught by Brigadier Showers at Dewása in Rajputána, and his force routed and dispersed. Tantia fled through Márwár, but was again fallen upon by Holmes.

At length, to use his own words, Tantia became "tired of running away"; Firoz Shah separated from him, and, having quarrelled with his chief the Rao Sáhib, Tantia left the remnant of his force at Saronji and took refuge in the jungle near Paron, under the protection of Rája Mán Singh, whose clansmen, faithful as Highlanders, never revealed the hiding-place of their chief's guest, though he was for upwards of five weeks within a few miles of Sir Robert Napier's force of 2500 men.

Such was the situation in the beginning of 1859, when Major Meade, having completed his inquiry, joined the force of 'Sir Robert Napier, then' moving from Nahnaghar, near Sheopur, to Saronji, fifty or sixty miles south-east of Guña.

He was placed in charge of a field detachment of 260 Europeans, 500 native infantry and 250 cavalry (Meade's Horse), and directed to move on to Sirsi Mhau and open out roads and endeavour to capture or destroy Rája Mán Singh or Tántia Topi.

His proceedings and their results are thus described in a memorandum found amongst Sir Richard Meade's papers:—

"I reached Sirsi Mhau on the morning of the 3rd of March, and found it wholly deserted. The village, containing probably some 2000 to 3000 inhabitants, belonged to Thakor Naranjan Singh, an old man of sixty-five years of age, formerly a Pindári leader, who was connected with Rája Mán Singh and possessed much influence in the neighbourhood.

"It was known that Mán Singh had resided for some time at Sirsi Mhau, and that Naranjan Singh and his people had all been more or less concerned in his depredations, and retaliation for this was feared by the Thakor and his people.

"On the afternoon of the 3rd March I pushed a strong patrol through the Sirsi *ghát*, a difficult ascent of 400 or 500 feet to the higher plateau of the Jaláwar tableland, and opened communications with Major Little's column the same evening. During the 5th I was joined by his force and every exertion was made to clear a road up the *ghát*, which was rugged and

densely wooded. This work was continued during the 6th, 7th and 8th, up to which dates I could get no tidings of Naranjan Singh.

“On the morning of the 8th I received information that Naranjan Singh with many of his people was at a village four or five miles distant. All the accounts that had reached me satisfied me that it was of the utmost importance to get him in, both for the local settlement of the immediate district and for the purpose of opening a communication with Mán Singh through him. I therefore determined at once to go and see him, and, taking two sowars (native horsemen), I galloped off to the village where I heard he was. On arriving there his son came out and I told him to tell his father that I was going some distance farther to examine the country, but that I expected he would be ready to see me on my return. On my return I found him with some fifty or sixty people waiting for me. He appeared nervous and alarmed, but I addressed him kindly and endeavoured to reassure him. Before I left him he promised to return to Sirsi Mhau that afternoon. This promise he fulfilled and the same evening I had a long conversation with him, which ended in his engaging to bring Mán Singh's confidential man to me in two or three days, and to do all in his power to induce Mán Singh himself to surrender.

“On the 11th March his son brought in Mán Singh's confidential man. I had a long conversation with him and communicated to him the conditions I was authorised to offer Mán Singh, *viz.*: a guarantee of life and subsistence; and I dismissed him the following morning with instructions to find out the Rája's family and household, and to invite them in my name to come in

to me, in which case I promised to do everything in my power for their comfort. I sent with him a confidential orderly, with a communication addressed to the Ránis to the above effect, and another to Mán Singh himself, inviting his surrender; I however particularly instructed both the messengers that their first efforts were to be directed to get in the ladies and their followers, as if this were effected I felt sure that Mán Singh would follow them.

"I continued moving about till the 25th March, but could get no intelligence of Mán Singh or his people. The entire country was hostile to us and no one would give us information.

"But early on the 25th I received notice of the advent of the ladies and household. They arrived, in number about seventy people, that afternoon. I received them kindly and sent them the next day to one of the Rája's villages. . . .

"After some further communication with Mán Singh I had the satisfaction of receiving him in my camp on the morning of the 2nd April. During that and the following day I had many conversations with the Rája, and urged him to perform some service to entitle him to the consideration of the Government.

"At 11 P.M. on the 3rd I received intelligence that the Rája's uncle, Ajít Singh, with a band of rebels, was some fifteen miles off in the jungle, and at once started off with a party of 150 men to attack him, Mán Singh himself accompanying me. We reached the place where he had been marked down the previous night before daybreak, but found that he and his band had moved off during the night. We pushed on some seven miles farther to a place where the jungle

was so dense that cavalry was useless and at which the rebels still were. It was now broad daylight, and, though we got close to them unobserved, they became aware of our approach before we could close on or surround them and to our great mortification all got away.

"We returned to camp at 1 P.M. that day, the 4th, utterly worn out and disappointed, having marched forty-five miles since 11 P.M. the previous night. Mán Singh was also in great despair at the result of the attempt to catch his uncle, who had threatened to take his life for coming in. All, however, was ordered for the best; Tantia Topi was then in the same jungle, and, had we attacked Ajít Singh, he would doubtless have taken the alarm and got out of the way. During the next three days I became fully satisfied that Tantia Topi was in the neighbourhood, and at length I got Mán Singh to acknowledge that he could point out where he was. I had the utmost difficulty in bringing him to the point of consenting to betray him and to enable us to catch him; at length, on the afternoon of the 7th April, he agreed to put him in my hands.¹

"Much caution was necessary, as Tantia Topi had spies in my camp, and I could not therefore send an officer or European troops upon this duty; I selected therefore a party of the 9th Bombay N.I. under an intelligent native officer, and despatched them into the

¹ Great indignation has been expressed at the conduct of Mán Singh in betraying his guest; but it must be remembered that as a *mediatised* chief he owed a great deal of gratitude to the British Government, which had protected his family for forty years. He died in 1882, and has been succeeded by his son Gajendar Singh.

jungle that evening, and, under Mán Singh's direction, they captured Tantia Topi and brought him a prisoner into my camp by surprise the following morning.

"It appeared that he had already started to join the rebels near Saronj, and that he had been in full communication with the Contingent troops (1000 strong) at Sheopur, whom he endeavoured to induce to join him.

"He stated, after his capture, that he was quite set up by the rest he had enjoyed, and that he intended recommencing his movements about the country, doing all the mischief he could.

"I took him to Sípri and tried him there by court martial, by which he was sentenced to death. He was hanged at Sípri on the 18th April, 1859."

Nothing was found upon him but a sword, a *kúkri* (a formidable knife¹), and a purse containing 118 gold pieces. His two attendants, who may have had his papers, unfortunately escaped.

Tantia Topi was a Brahman by caste, and described himself as a native of the district of Púna (which has been British territory since 1818), and a resident of Bithúr, near Cawnpore (also in British territory), where he was in the service of the Nána as *musáhib* or A.D.C. He is said to have served for a time in the East India Company's army, and, at a later period, to have exercised the calling of money-lender; he entered the Nána's service in the capacity of *karáni*, i.e., writer or accountant, but rose to the posi-

¹ Shaped something like a cob of maize (*kúkri*), whence, probably, its name.

tion of confidential agent. He spoke Urdú as well as Gujaráthi and Maráthi. His knowledge of English was very limited, but he could write his name in English characters.

In appearance he was a man of forty-five to fifty years of age, about five feet six inches in height, stout and well made; he had a particularly large head, of great breadth from ear to ear, covered plentifully with strong grey hair, with beard, moustaches and whiskers to match. His cheek-bones were slightly elevated, and his black eyes, under sharply arched eyebrows, were clear and piercing. Altogether his features are described as intelligent and expressive, denoting decision, energy, and ability. He answered questions put to him in Hindustáni curtly and apparently straightforwardly.

Before his trial Tantia Topi dictated a statement (which he carefully corrected) giving a concise account of his career from the date of the mutiny at Cawnpore to the time of his capture.

This statement, a translation of which is given *in extenso* in vol. vi. of Colonel Malleeson's *History*, is a remarkable one. It is so terse and business-like as to be wearisome; but, so far as it can be tested, the narrative is, for the most part, singularly accurate. It nowhere minimises defeats or exaggerates successes, and gives the impression, at any rate, of being strictly true:

On two important points, however, Tantia's statements are quite at variance with general belief.

He asserts that the Nána Sáhib, usually believed to be a main-spring of disaffection, joined the mutineers

in the first instance under compulsion and was in fact a mere puppet in their hands.

Some colour is given to this statement in the report of Lieut.-Colonel Williams, Commissioner of Military Police, who, during 1858-9, made elaborate inquiry into the circumstances of the Cawnpore defence, surrender, and massacres; for he states "that the Nána and his court possessed little or no authority over the rebel troops, who, it is evident, did just as they pleased".

However this may be it is clear, from Tantia Topi's own admission, that the Nána afterwards identified his cause with that of the rebel troops; and (so Colonel Williams tells us) in counsel with his brother Bála Sáhib and Azímullah, his *vakeel*, induced the rebels, when on their way to Dehli, to return to Cawnpore and carry on the siege.

With regard to the massacre at the *ghát*, Tantia Topi asserts in his statement and asserted verbally before execution that, under the direction of the Nána, he prepared the boats in good faith for the despatch of the fugitives, and placed provisions in them and started them; and that the massacre which followed was entirely the work of the infuriated sepoys, the Nána himself being innocent of all participation in it.

In the case of the Nána there is some evidence that, on news being brought to him in cantonments that women and children were being massacred at the *ghát*, he sent orders to the sepoys to cease firing; but as he had, as we have seen, "little or no authority over the troops," this was of little use.

But as regards Tantia Topi the truth of the state-

ment has been emphatically denied by Mr. G. Lance, formerly magistrate of Cawnpore, who avers that there is ample evidence to show that Tantia, if he did not first plan the massacre, assisted in it by posting his men in ambush at the *ghát*, or by giving orders to that effect to Jawála Parshád, the Nána's brigadier-general of the mutinous regiments.

In regard to the question, who gave the signal for the massacre to commence? the evidence is conflicting. Two witnesses distinctly state that it was Tantia Topi. But other witnesses state that it was the Nána's brother, Bála Sáhib, or Azímullah, his *vakeel*. Colonel Williams seems to consider that it was the two latter and not Tantia Topi. The fact that the firing commenced on the Oude side of the river seems to indicate that in *carrying out* the massacre the Sepoys may have acted independently of the Nána's people. But this, if true, does not absolve the latter from the charge of *planning*, or, at least, *permitting* it.

And all agree that Tantia Topi was present in the Fisherman's Temple and that neither he nor any member of the Nána's party took any visible steps to prevent the massacre.

There is no evidence directly connecting Tantia Topi with the second massacre (in the *Bibighar*), but it was committed within 100 yards of the Nána's headquarters and was not disavowed at the time either by the Nána or his staff.

From a general review of the evidence the probability appears to be that the Nána, under the influence of his more determined brother, and his unscrupulous *vakeel*, of Jawála Parshád (his brigadier), and one

Tíkam, an officer of one of the rebel regiments whom he had promoted, passively assented 'to atrocities he was too inert to plan and too irresolute to stay, and that Tántia Topi acted as his henchman.

The Government of India was very anxious that the question of Tántia Topi's complicity in the massacres should be dealt with at the trial, and on the 14th April, 1859, telegraphed to Colonel Williams, then at Allahabad, to send all available information to Meade's superior, General Sir R. Napier. But the information, if sent, arrived too late.

Accordingly Tántia Topi was not charged at his trial (which took place on the 15th) with complicity in the Cawnpore massacres or with murder, but with "having been in rebellion and having waged war against the British Government between January, 1857, and December, 1858, especially at Jhánsi and Gwalior".

In answer to the charge he said (in Urdú):—

"I only obeyed in all things that I did my master's orders, that is to say the Nána's orders, up to the capture of Kálpi, and afterwards those of the Rao Sáhib. I have nothing to state except that I have had nothing to do with the murder of any Europeans, men, women, or children; neither did I at any time give orders for any one to be hanged."

He declined to ask the witnesses any questions.

He was found guilty of the offence charged, and very properly sentenced to death.

After sentence he comported himself with dignity and bravery, replying briefly and clearly to pertinent

inquiries courteously made, but dismissing unnecessary or flippant questioning by a curt *Mâlum nahî* (I don't know). "A glance of" great contempt is observed on his countenance," says the *Times* correspondent, "when following the departure from his presence of some mediocre superior; but for Major Meade Tantia appears to have considerable respect."

He evinced no craving for life, and, even before his trial, he begged that he might be put out of his misery as soon as possible. "Blow me from a gun or hang me, but deliver me from these!" he said, holding up his irons.

He expressed no wish to see his family, but spoke tenderly of his *babalog* (children), and prayed that the Government would not allow them to suffer for any offence he had committed. He maintained to the last his innocence of murder.

He was executed at 4 P.M. on the 18th April, on the parade ground near the fort, in a square formed by the troops of the garrison, and surrounded by a large concourse of native spectators.

On his irons being removed he ascended the gallows with a firm step and placed his neck in the noose with the greatest *sang-froid*.

The propriety of the sentence has been called in question, and the *Friend of India*, commenting on the event, observed: "Among the horde of princelings, zemindars and adventurers, who rose to command among the mutineers, Tantia Topi is the only one whose fate will elicit in India a solitary expression of regret".

But his execution can be fully justified. It is true that his complicity in massacre, though generally believed, was never judicially established; but, irrespective of such complicity, it was proved at the trial that he was an important leader of rebellion; and, as the author of incalculable mischief and misery and loss of life. At the time of his capture he was engaged in planning fresh enterprises; his escape from captivity was by no means an impossibility; and in the circumstances of the time clemency would have been misplaced. His prompt execution, therefore, being in accordance with the law (Act xiv. of 1817) was urgently called for in the interests of peace. The tranquillised forthwith vast tracts of country saved, there can be little doubt, a multitude of

But his complicity in massacre, though never judicially investigated, is sufficiently proved for the purposes of history. The exact degree or extent of his complicity may, indeed, be open to dispute, but that he was *particeps criminis*—whether as prime mover or subordinate agent, or accessory, matters little—admit of no reasonable doubt.

The value of the service rendered by Major Meade was at once recognised by public opinion throughout India. He was warmly congratulated by his political and military superiors, Sir Robert Hamilton, the Governor-General's Agent for Central India, then on his way to England, and Brigadier-General Sir Robert Napier commanding in Gwalior; and by the General (Hugh Rose) whose splendid recapture of the city and fortress was described in the last chapter. In reporting the capture Sir R. Napier described it

CORDIALLY THANKED FOR HIS IMPORTANT SERVICES, SI
"national service," and a few months later the Govern-
ment of India thus recognised the good work done :—

"From the Secretary to the Government of India to the
officiating Adjutant-General of the Army.

"Dated 26th August, 1859.

"SIR,—With reference to the letter . . . forwarding for the
information of Government documents relating to the capture
of Tantia Topch, and the surrender of Mán Singh, I am now
desired to acquaint you, for the information of the Rt. Hon.
the Commander-in-Chief, that His Excellency the Governor-
General in Council considers the proceedings of Brigadier-
General Sir R. Napier, K.C.B., and Major Meade to deserve
the best thanks of Government.

"The admirable judgment exercised by the latter officer is
especially to be commended. The value of his service has
been thoroughly tested by the four months which have passed
since it was rendered, and it may safely be said that few in-
cidents in the contest which we have been waging in India
have had a more direct effect in facilitating a return to peace
and order than the surrender of Mán Singh and the capture
of Tantia Topch, both the work of Major Meade.

"I have, etc.,

"R. J. H. BIRCH, Major-General,

"Secretary to the Government of India."

The Secretary of State for India endorsed the re-
cognition of Meade's service, and in an autograph letter
to Major Meade Lord Canning speaks of it as a
"service for which the State is deeply indebted to
you".

Sir Hugh Rose wrote as follows, and his letter is
specially interesting, as it expresses his opinion of the
military abilities of Tar

"POORAH, 14th January, 1860.

"MY DEAR MAJOR MEADE,—I am *extremely obliged* to you for your kind letter and Tantia Topee's confession, both of which I received to-day. . . .

"I have always thought that you rendered a most important service in effecting the capture of Tantia Topee, and I think that his success in escaping his pursuers, of every kind, is the best proof of the tact, ability and knowledge of the country and its inhabitants with which you effected the capture.

"There can be no doubt that of all the rebel chiefs who acted a part in the rebellion Tantia possessed the greatest enterprise, as regards initiation, and the most enduring resolution in character. His talents for organisation were also remarkable. You have no idea how much talent he displayed in this way in the preparation of the so-called Peishwa's army (which I see he estimates at 600 men); he had a little siege train, with the requisites in a rough way, and had not forgotten material for Jhānsi, which he intended to relieve.

"I hope you have been well rewarded for the service you did. . . .

"Yours sincerely,

"HUGH ROSE."

But perhaps the best testimony to the importance of the service rendered is to be found in the number of those who claimed a share in it. These are humorously described in the following doggerel lines by a sergeant of the 3rd Bengal Europeans :—

"Who caught Tantia Topee?

'Twas I, said the Digger,¹

With spade, sword, and trigger,

I caught Tantia Topee.

¹ Brigadier-General Sir R. Napier, R.E., who sought to find Tantia by driving a number of cross-roads through the jungle, where he was known to be hidden.

"Who caught Tantia Topee?

'Twas I, said Pat Meade,

By palaver and speed,

Who else did the deed?

"Who caught Tantia Topee?

'Twas I, said "our Showers,"¹

By hot haste and dours,

He funk'd me, he did, "by the Powers"!

"Who caught Tantia Topee?

'Twas I, said Durbár,²

With my spies near and far,

And Maun Singh through my own *Commasdár*.³

"Who caught Tantia Topee?

'Twas I, said Maun Singh,

Who planned the whole thing,

To save my own neck from the string!

"Who caught Tantia Topee?

Not I, said old "Mac,"⁴

But I hunted the pack,

And when they get back

We'll put in, one and all, for *the lac*!"⁵

¹ Brigadier-General Showers, whose successful attack on Tantia Topi's force at Dewása in Rájputána broke up his following and drove him to seek refuge with Mán Singh.

² The Gwalior Native Council of State.

³ *Komisdár* (properly *Kamávísídár*) is a Marátha sub-collector of revenue, the same as a *tahsildar* in Northern India. *Naib-Komisdár Pirbhú Lal* was of great assistance to Major Meade.

⁴ Major Macpherson, Political Agent at Gwalior.

⁵ The Government of India offered a lakh of rupees reward for the capture of Tantia Topi. If any one deserved the reward it was Major Meade and those with him. But Major Meade neither asked for nor received any pecuniary recompense.

Though the surrender of Rájá Mán Singh and the execution of Tántia Topi had, as we have seen, a marked effect upon the public peace, especially in the territories of Gwalior, there were still gatherings of rebels outside those territories, whose dispersal or destruction was necessary before the *pax Britannica* could be said to be completely re-established.

At length on the 1st July, 1859, Meade received intelligence of a large gathering of mutinous sepoys and local rebels in the Jhánsi district at a place called Garroya or Garwai.

Taking with him a squadron of his Horse, and a small force from Sípri, Meade made a night march of thirty miles, and early on the morning of the 2nd July was fortunate enough to surprise the enemy, whom he at once attacked and utterly dispersed with the loss of upwards of 100 men, and two of the principal local chiefs.

This successful affair virtually closed the rebellion in this part of India, and Meade and his force received the thanks of the Government of the North-West Provinces, the Commander-in-Chief, Lord Clyde, and the Supreme Government.

The success also closed Meade's career as a military officer, for now, as we shall see, a new sphere of duty was offered to him.

CHAPTER VIII.

WORK AS POLITICAL AGENT AT GWALIOR.

Meade appointed acting Agent—Letter from Lord Canning—Meade rapidly acquires influence over Sindhia—Secret of his success—Interview with Lord Canning at Agra in 1859—Is thanked for his services, and in 1860 confirmed in his appointment—Handsome testimony from Lord Canning, by whom he is frequently consulted—Negotiates the treaty of 1860 with Sindhia, and on the death of Sir R. Shakespear is offered and accepts the important post of Resident at Indore and Governor-General's Agent for Central India.

WE enter now upon a new phase in Sir Richard Meade's career.

For upwards of twenty years he had served his country as a soldier, with credit, indeed, but with little opportunity for distinction, and little hope of advancement outside the ordinary routine; but he had made the best use of his opportunities, and when the time came, he displayed qualities which marked him as well fitted not only for the military but also for the political service of the Government, a service in which military training and experience are, indeed, of no small value, but in which sound judgment, patience, and an intimate acquaintance with oriental character are the most important requirements.

In July, 1859, Major Macpherson, the Political Agent at Gwalior, whose health had severely suffered from the heat of Gwalior, and the intense strain upon

his mind during the Mutiny, and the difficult and anxious times which followed, applied for temporary leave, and recommended that Major Meade should be appointed to officiate for him.

Lord Canning at once acted on the recommendation. On the 9th August Meade was gazetted as officiating Political Agent of Gwalior, and on the 25th received an autograph letter from His Excellency, from which we quote the following paragraph:—

“I hope that your new functions at Gwalior will be agreeable to you. If you bring to the discharge of them the same energy, patience, and tact, which have marked your performance of other duties, I shall have good reason to rejoice that a delicate charge is in such good hands.”

The Governor-General was not disappointed. Major Meade rapidly acquired a remarkable influence over the Mahārāja Sindhia, as he did over every chief with whom he was subsequently brought in contact.

What was the secret of his success?

It was not the result of any acquired art of statesmanship. It could not have been so in Meade's case, for he had received no diplomatic or even administrative training.

He had, it is true, the advantage of more than twenty years' experience of native character in different parts of India. But this, though an important element of efficiency in a political officer, is by no means the most important.

Meade was also a fair linguist. He knew Persian and Urdú, and had colloquial knowledge of Maráthi. But linguistic attainments, though valuable, are by

no means essential to 'success; the late Sir Robert Sandeman, for instance, one of the most successful politicals of modern times, knew little of the language of the tribes and races with whom he had principally to deal.

What was it then?

It was simply this: Meade added to the qualifications above described all the characteristics of the ideal "English gentleman,"—firmness and loyalty to the Government he served, deep interest in the chiefs and peoples of the States where he was employed, good sense, straightforwardness, unbounded patience, a most genial manner and a scrupulous regard for the feelings and position of the Prince to whom he was accredited. He worked with him as a friend, keeping the "representative of the Paramount Power" in the background; he educated without lecturing, and governed without seeming to do so.

He was thus enabled to bring to a successful issue many questions of difficulty which had hung fire for a long time, and in regard to which the chief had shown himself more or less impracticable. *Inter alia* he induced His Highness to assign large tracts of land required by the British Government for railway purposes in Nímár, to allow the railway authorities jurisdiction over all persons residing within railway limits, and to grant to the Agent to the Governor-General for Central India power to decide all disputes between railway servants and subjects of the Gwalior State.

Meade's success was soon recognised.

In October, 1859, Lord Canning held a grand dur-

bar at Agra, for the reception of the loyal chiefs and gentry of the North-West Provinces, who had done good service in the 'Mutiny—one of the brilliant series of gatherings at which the dignity of his presence and speeches left an impression never to be forgotten. On this occasion His Excellency specially sent for Meade, and on his arrival shook him warmly by the hand, and intimated that he had particularly desired Meade's attendance to thank him, in the name of the Government of India, for his services when acting as Political Agent; and further inquired whether he would wish to be permanently transferred to the political department.

Major Meade was gratified but not elated, for in a letter to Mrs. Meade he says:—

"At Agra I received the greatest kindness from Lord and Lady Canning . . . but I fear my visit has not done me much good; for, to tell the truth, I was somewhat overwhelmed at having to occupy a position to which I was so little accustomed".

But Major Meade's idea of the impression he had created was erroneous.

On the 15th April, 1860, Major Macpherson, weary in mind and body and, as yet, unhonoured,¹ died in Calcutta, of the same disease which was soon to carry off the Viceroy himself. In the same month Meade was confirmed in the appointment, and in a private letter announcing the event Lord Canning wrote as follows:—

"I wish you to know that I never made an ap-

¹ The *Gazette* notice of his appointment as C.B. appeared after his death.

pointment regarding which I was so satisfied that it was for the interest and credit of the Government and for the honour and advantage of the native State concerned as in the case of your own appointment at Gwalior.

“The conduct of your duties, while officiating for your predecessor, has been so uniformly judicious and temperate, and so entirely in the spirit of an English gentleman—firm in the discharge of the duties prescribed to you, and thoroughly respectful, considerate and friendly to the Prince to whom you are accredited—that I have no doubt of the benefit which will result from your permanent appointment.”

There was another reason why Meade's permanent appointment was specially desired by the Viceroy. Dinkar Rao, Sindhia's able minister, who was devoted to British interests, had for some time been losing favour with his master, and in December, 1859, vacated office, and thereupon Sindhia himself superintended the whole of his affairs. It was, therefore, of the greatest importance that the representative of the British Government should have personal influence over the Gwalior Chief. Though Meade was unable to prevent Dinkar Rao's dismissal, he prevailed upon the Chief to recognise his past services by the grant of a valuable *jāgīr*.

From this date Meade found himself in the position of confidential adviser to Lord Canning on matters of great delicacy and importance, *e.g.*, in regard to difficulties connected with the conferment of the Order of the Star of India upon Ruling Chiefs; and the ap-

pointment of Dinkar Rao to a seat in the Legislative Council of India. On both these subjects important communications passed between the Viceroy and Major Meade, showing clearly the value attached by Lord Canning to Major Meade's opinions; but we do not quote them *in extenso*, as their subject-matter, besides being confidential, is no longer one of public interest.

In the same year he induced the Mahārāja to consent to the construction of a bridge over the river Chambal, thus removing a great obstacle to rapid communication between Gwalior and Agra; and, after protracted discussion, he succeeded in negotiating a treaty between His Highness and the British Government (the treaty of 1860), by which important interchanges of territory were effected between the two Governments. Lands yielding a revenue of three lakhs of rupees together with the city and fort of Jhānsi were transferred to the Mahārāja; *per contra* certain of the territories assigned for the support of the Contingent Force were transferred in full sovereignty to the British Government, and the British Government engaged to keep in the place of the late Contingent a Subsidiary Force constantly stationed within His Highness the Mahārāja's territories, while the Mahārāja's force of all arms was increased to 5000 infantry, 6000 cavalry and thirty-six guns.

These arrangements appear simple enough on paper, but their successful negotiation involved infinite tact and patience, which only those who have been engaged in a similar task can adequately appreciate. But his work was warmly appreciated by his immediate superior, the Governor-General's Agent

at Indore, who observed in his covering letter to the Government :—

“ I am very deeply³ indebted to Major Meade, whose influence and judgment were most useful to me ; and whose untiring exertions were invaluable in aiding me, not only during the conferences, but in conducting personally, when I was not present, the discussion with the Mahārāja of many complicated and delicate questions ”.

The Government of India “ gladly concurred,” and the services of both officers were thus referred to in the Secretary of State’s despatch of 8th May, 1861 :—

“ It only remains for me, whilst congratulating your Excellency on the success of these negotiations with the Gwalior Durbār, and confidently anticipating their good results to both Governments, to express my approbation of the manner in which they have been carried out by the officers by whom you were so efficiently represented at Sindhia’s court. To Sir Richmond Shakespear and to Major Meade your Excellency⁴ has conveyed your acknowledgments, and I have to request that they may be informed that Her Majesty’s Government entirely concurs in the commendations which you have bestowed upon them.”

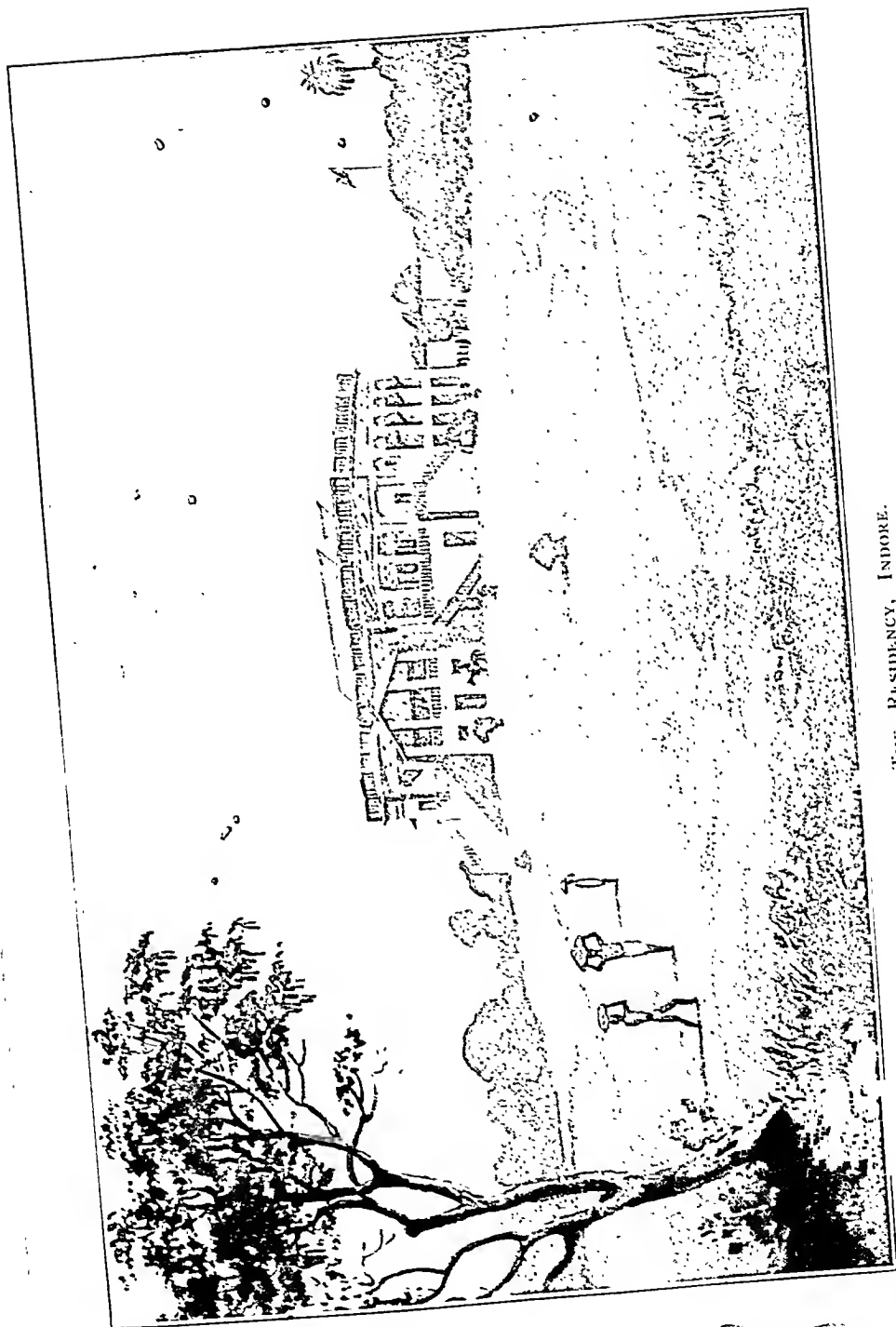
A more substantial recognition was soon in store for him.

In November, 1861, Colonel Sir Richmond Shakespear, who had succeeded Sir Robert Hamilton as Resident at Indore and Agent to the Governor-General for Central India, died very suddenly, and a political appointment of the greatest importance became vacant—an appointment usually conferred upon officers of long departmental training.

At a ball given at Allahabad at the end of November, 1861, on the occasion of the investiture of Sindhia and other chiefs with the Order of the Star of India, Lord Canning sent for Meade, and, to his profound astonishment, offered him the vacant post. After a moment's hesitancy, the result of surprise and modesty, not of disinclination, the offer was gratefully accepted.

In December, 1861, he bade adieu to Gwalior, one of the hottest and most trying stations in India, and proceeded to the palatial Residency at Indore, with a far cooler climate and more genial surroundings.

An account of the new scene of Major Meade's labours, where he was destined to remain for upwards of eight years, and the new duties devolving upon him, will be given in the succeeding chapter.



THE RESIDENCY, INDORE.
(From a Sketch by Mrs. Daly.)

CHAPTER IX.

WORK AS GOVERNOR-GENERAL'S AGENT FOR CENTRAL INDIA.

Description of Central India—Its political importance—The great Marátha States—Bhopál—The “mediatised” chiefs—Contingents—The States in Bundelkhand and Baghelkhand—Conflicting interests—Differences settled, and the peace maintained by the Governor-General's Agent and seven subordinate Political Agents—The British Force in Central India—The local corps—The residency at Indore and its surroundings—Improvements effected by Meade and his successors—General condition of the States of the Agency at the time of Meade's appointment in respect to police, administration of justice, military forces, education, public works, roads, jail buildings, forest conservancy—Gwalior and its ruler—Questions to be dealt with—Indore and Holkar—Bhopál—The minor States of Málwa—Mánpur—The States of Bundelkhand and Rewah—Important political and administrative work devolving on the Governor-General's Agent.

THE jurisdiction of the Central India Agency extends over two groups of protected native States, occupying the hilly region between the Chambal and Jamna rivers on the north, and the Narbadda on the south¹—the two groups being separated from each other by the valley of the Betwa, a picturesque but unnavigable stream, which, rising in the Vindhya mountains, near Bhopál, flows in a wide and winding and rocky channel into the Jamna near Hamírpur.

¹ A small portion of Holkar's territory extends to the south of Narbadda.

The territories of the western group include Gwalior (already described), the great Málwa plateau and the Sátpúra highlands; those of the eastern are known as Bundelkhand and Baghelkhand (or Rewah), that is, "the land of the Bundelas and Baghels," two tribes of Rájput origin, once dominant in the locality.

In all they cover an area of about 83,000 square miles—an area, that is to say, larger than England and Scotland combined—and have a population (chiefly Hindú) of about 10,000,000, and revenues roughly estimated at 300 lakhs of rupees per annum.

As might be supposed in a region so extensive the character of the country and its people varies greatly. On the south-west are desolate wilds and jungles, the home of the Bhíl tribes, an aboriginal race, abhorring labour, whose gradual reclamation from a life of savagery is one of the special functions of the Agency; farther east are the rich plains of Málwa, peopled by thrifty agriculturists, producers (*inter alia*) of the finest opium; then the hill-tracts of Ummatwára, Sironj and Kichiwára, with scanty cultivation and long stretches of dense jungle; farther north by east is the country about Gwalior, open and treeless and once desolate, but now well cultivated and prosperous; and still farther east the submontane region of Bundelkhand and Baghelkhand on the northern spur of the great Vindhya range; part of it (on the north-west) a fertile plain of black cotton soil, interspersed with granite ridges and detached hills, part rising abruptly by successive plateaus to the level of the Vindhya tableland; a region of forests and foaming rivers and grand waterfalls, with precipices overhung with foliage

overlooking fertile valleys, and broad sheets of splendid cultivation carefully irrigated from wells and tanks and streams; a region, in Meade's time, comparatively little known, but now, thanks in no small measure to our "politicals," surveyed and mapped, and traversed by four lines of railway.

But the charm of Central India lies, not only in its varied scenery, but in the interest and extent and splendour of its archæological and architectural remains.

Around Bhilsa, in Gwalior territory, not far from Bhopál, is a collection of Buddhist monuments—some, possibly, of an age anterior to Asoka, but most of them ranging between B.C. 250 and A.D. 79—a collection grander than can be found elsewhere in the whole of India, from the Satlaj to Cape Comorin.¹

At Sánchi (hard by), on a mound overlooking the valley of the Betwa, stands the most perfect *top* in India—a domed building, 106 feet in diameter, and 42 feet in height—with an inscription in the old Lát characters, which fixes its date at the first half-century of the Christian era.

Again, in the fortress of Gwalior, and in those of Ajáigarh and Kalinjar, in Bundelkhand, and at Kajrao, in Chatterpur, near Nowgong, are the remains of elaborately carved Jain temples and inscriptions, dating from the first to the tenth century A.D.

While in the petty principality of Dhár, on the western edge of the Central Indian plateau stand the ruins of Mándú; once a Hindú stronghold, then, in the fifteenth and sixteenth centuries A.D., the capital of

the Ghorian (Afghán) Rulers of Málwa. The ramparts have, it is said, a circuit of thirty-seven miles, and the principal mosque and palaces are among the finest specimens of Patán architecture in India—and standing, as these ruins do, in solitude, overlooking the valley of the Narbadda, they convey “a very vivid impression of the ephemeral splendour of the Muhammadan dynasties of Central and Southern India”.¹

As to population, the dominant though not the most numerous race in Gwalior and Málwa is the Marátha—immigrants from the region south of the Narbadda, the highland home of their forefathers—a bold and vigorous peasantry, Hindús to the backbone, but not caste-ridden, whom the administrative weakness of the decaying Mughal Empire transformed into freebooters and guerilla horsemen.

It was the old story. First utilised as mercenaries, they learned their strength. Then, amid the ruins of old Hindú principalities, they challenged the existence of Muhammadan supremacy,—a supremacy no longer represented by hardy northern warriors, but by luxurious camps, by showy but ill-disciplined horsemen, and armies of slaves and menials commanded by “silken generals”.

Led by Sívaji and his successors their marauding bands overran the territory of the oppressor. Their standards waved over the plains of Hindústán and the gleam of their lances was seen along the banks of the Indus. From the Indus to the Ganges, from the

¹ Among modern buildings of interest may be mentioned the tomb of Abulfazl, the chronicler, Akbar's secretary, who died in Gwalior at the close of the sixteenth century.

THE RUINS OF MANDU



families of Patán or Mughal origin, descendants from old Government officials and military settlers, have a good position. Brahmans are "numerous in all the better callings, both in town and country, but (strange to say) are not held in much account.

Politically the region is important. The western portion includes the great Marátha States of Gwalior and Indore, with territories greatly intermixed; the compact Muhammadan kingdom of Bhopál, next to Hyderabad the greatest of the Mussulman States of India; and three other States (two Marátha and one Muhammadan), under direct treaty engagement with the British Government; and ninety-four minor chiefships chiefly Rájput;—some held direct from the British Government though not by treaty, some under engagements "mediated" between them and their feudal superiors, the great Marátha chiefs, by the British Government and known technically as "mediatised chiefships".

The principal States pay no tribute, in the ordinary sense, but are required to contribute to the military defence of the empire. This was done up to the year 1857 by providing or contributing to the provision of Contingents of native troops officered by Englishmen. But every one of these Contingents—the Gwalior Contingent, the Mehidpur Contingent, the United Málwa Contingent and the Bhopál Contingent—being composed of the same materials as our own army—mutinied in 1857, and either joined the enemy or had to be disbanded; and were, in Meade's time, represented by three newly formed local corps, organised on the "class system" and recruited from local tribesmen and races

known to be loyally disposed. These corps still exist and are further described below. In addition, some of the chiefs,—notably Gwalior, Indore, Bhopál, Kashmír, the Sikh chiefs and others—have of late years formed from their own armies Imperial Service corps, some of which have already earned distinction, but these had no existence in Meade's time.

The eastern portion of the Agency includes the States of Bundelkhand—with populations similar to those of Málwa, but all holding directly, by treaty or *sanad*, as the case may be, from the British Government—and Rewah (a Baghel chiefship) and three smaller States, with domains stretching to the confines of Bengal, more backward in many respects than Bundelkhand, but in parts well cultivated, and possessing extensive treasures of timber, coal and minerals.¹

In all the number of separate chiefs under the protection of the Agency exceeds 200, with feelings and interests frequently divergent and each jealous of his neighbour. The Rájput, proud of his ancestry, hates the Marátha "foreigner"; Sindhia, if he dared, would destroy Holkar;² while the Muhammadan—as a product of Mughal domination—claims (in his heart) to be the lord of all. But for the controlling hand of the Paramount Power and the tranquillising effect upon the Rájput clans of Malcolm's system of "mediatised"

¹ Little was known in Meade's time of the resources of Baghelkhand, but it is now traversed by two lines of railway, and its coal sources are being exploited by a company.

² This remark, it is needless to say, has no personal significance.

subchiefships, the territories would be (as they were before our advent) in a condition of perpetual unrest ; harried by border raiders, plundered by Pindáris, haunted by Thugs, and desolated from time to time by intertribal conflicts and the struggles of rival chieftains.

Amid these elements of strife and war, the *pax Britannica* is quietly but firmly maintained by the Governor-General's Agent for Central India (who is *ex-officio* Resident at Indore)—the local representative of the protecting Power, the guardian of treaty engagements, the arbiter-general of differences, and the friend and adviser of all. He was aided (in Meade's time) by a couple of English assistants at head-quarters, and seven subordinate Political Agents stationed in Gwalior, Gúnah, Bhopál, Bundelkhand, Nagode, Western Málwa, and the Bhíl country ; each with a staff of native subordinates and attended by *vakeels* representing the States controlled by him.

In support of the Agent's authority there were about 12,000 British troops of all arms, located in twelve cantonments or stations in suitable positions ; eight garrisoned by the regular army under the General commanding at Mhau, and four by local corps under the orders of the Agent. Of the total force about one third were Europeans ; the remainder were native troops officered by Englishmen, on the system successfully employed on the Punjab frontier.

At the time Meade joined, and indeed during the whole term of his office, the regular army had a quiet time ; for, since the last embers of mutiny had been amped out by Meade at Garroya, peace reigned

through Central India, unbroken save by occasional disquiet, on the Rájputána border, a few raids by Bhíls from the Sápúra hills, and quarrels between petty tribal chiefs and their superiors, or other disturbances of no political importance, easily dealt with by the local corps.

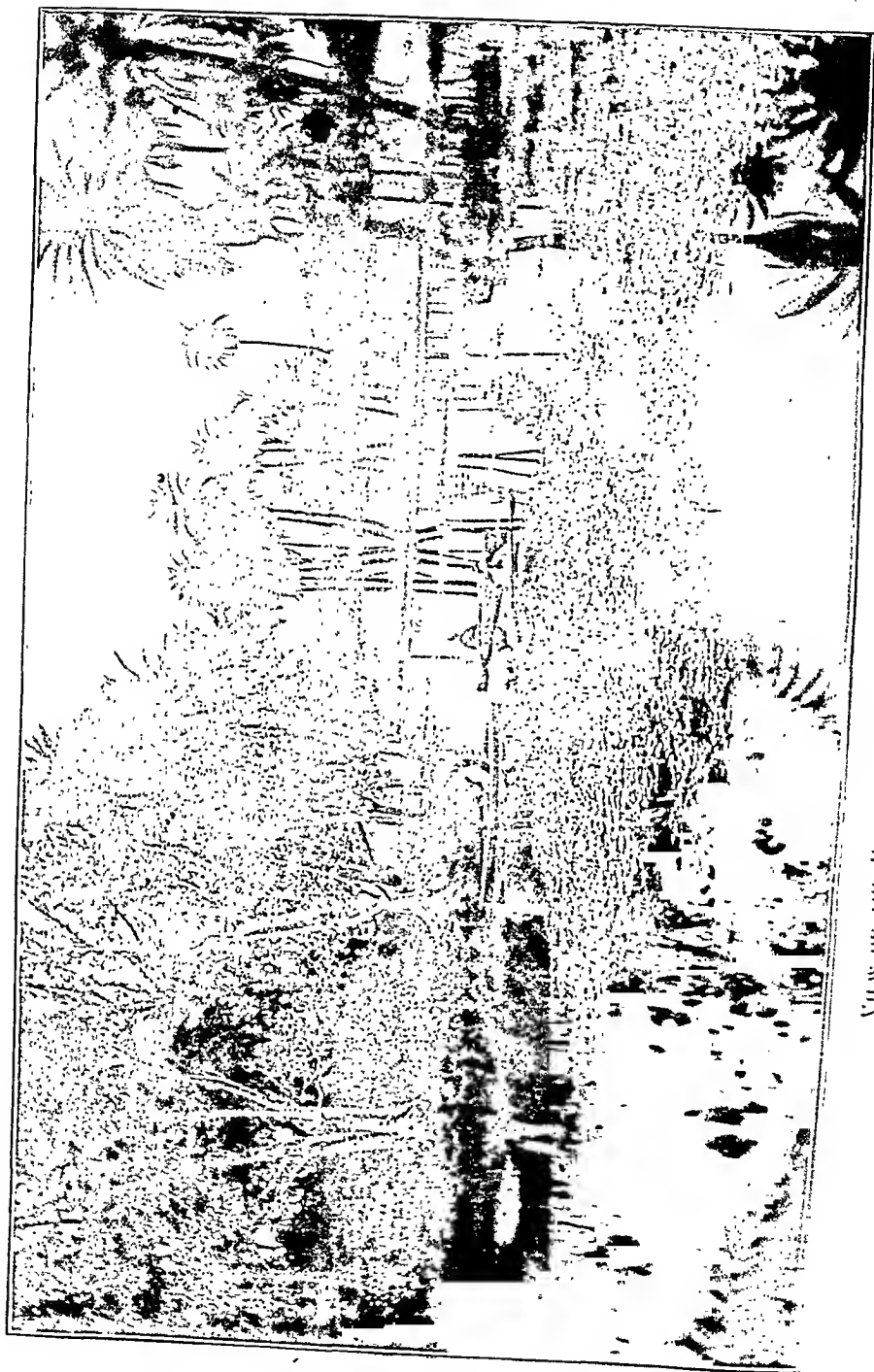
These (as we have already mentioned) were three in number:—

(1) The Central India Horse¹—into which “Meade’s Horse” had recently been merged—under the immediate command of Colonel Daly, Meade’s successor at Gwalior; a corps then usefully employed in protecting lines of communication and suppressing crime in Western Málwa; (2) the Bhopál Battalion, organised in lieu of the late Bhopál Contingent which had mutinied; and (3) the Málwa Bhíl Corps for controlling the wild tribes of the south-western border districts from which it was principally recruited.

Situated near the edge of the Málwa plateau, Indore has (for India) a fairly genial climate. April and May are hot, but, with the bursting of the rains in June, the south-west monsoon blows cool and fresh from the Indian Ocean, and all goes pleasantly till the end of March.

As for the Residency building, from a modern standpoint it could hardly be regarded as either picturesque or comfortable; but it was specially attractive in the eyes of Lady Meade from its association with her great relative. And it had the charm of being situated in grounds of singular beauty, which Meade was able greatly to improve. At the time he assumed office, they were disfigured by an unsightly water-course, dry and stony during a great part of the year, and brimming over in the rains; but by damming up and regulating the stream, generally deepening its bed and utilising the soil obtained from the excavations, Meade formed an extensive lake bordered with luxuriant foliage and dotted with islets planted with bamboo and flowering grass,—a lake, not only a thing of beauty, but a great public benefit, for it served also as a much-needed reservoir for the supply of water to the city. Following Meade's idea, successive Agents—and in particular Sir L. Griffin—have done much still further to improve the grounds, which are now said to be unequalled for beauty in the whole of India.

As Indore was unconnected by railway with the outside world, and Mhau—the military station—was fourteen miles off, the Residency, from a social point of view, was very quiet; but this absence of distraction was far from unwelcome to Meade, who found the task



VIEW OF THE RIVER IN THE RESIDENCY GROUNDS, INDORE.

of mastering the details of his charge and reorganising the work of the Agency, which had suffered severely from the effects of the great Mutiny, as engrossing as it was important and laborious.

After the early morning ride, he would receive any representatives of States, or other native gentlemen desirous of seeing him, and so patient and lengthy were his discussions, that the breakfast hour, nominally 10, was sometimes protracted until 12.30. After breakfast he disappeared into his office until dark, sometimes returning to it after the evening drive. After a late dinner, a quiet half-hour with a book and a game of billiards, at which he was a great adept, usually terminated the evening. Of course, a certain number of "*bara khánahs*" or official dinners were given; but the social requirements of Indore were very small compared with those of Mysore and Hyderábád, where a "public breakfast" was given once a week, and "big dinners" were frequent; where, in fact, the family rarely sat down to any meal alone, and official visits and entertainments took up a large amount of time. In Central India Meade spent usually some five months of every year under canvas,—traversing every part of his extensive Agency, visiting Chiefs at their capitals, settling disputes, suggesting improvements, inspecting schools, hearing representations, and gaining information of every kind. But there was one thing he could not do—though an excellent shot and rider, and a sportsman to the backbone—he could find no time for either shooting or hunting. The only out-door pastime he indulged in was boating or sailing on the lake he had himself created. In Mysore, too, he had a good deal of camp

life. But the work at Hyderábád kept him a good deal at head-quarters.

But we are anticipating, and must return to Central India. To enable the reader to understand the situation and gauge the progress of the Agency during Meade's incumbency, it is necessary to add a sketch of the condition of the States and their principal chiefs at the time he assumed office.

In most of the States—thanks to the influence of the Political Officers—there was some attempt at police administration, and the peace was, upon the whole, well preserved; in Bhopál and Gwalior and a few of the States which, owing to minorities or other cause, had been temporarily under British management, courts of justice with specially trained judges had been established; but, as a rule, the administration of justice, civil and criminal, was in the hands of executive officers, already overworked, who dealt with the cases, during spare moments, in arbitrary fashion, and were open to every kind of influence; for an independent judiciary, so much clamoured for by young India at the present time, is a thing unknown in native States. Except in the case of “mediatised” chiefships or States under British management, no appeal lies to the Agent from the decision of a chief or of the courts of justice in the States of Central India; but habitual and flagrant injustice would be a ground for depriving a chief of the management of his territories.

The military forces of the chiefs, especially at Gwalior, were nominally considerable, amounting in all to nearly 40,000 infantry, 13,000 cavalry and no less

than 535 guns; but, except in Gwalior, the troops were ill armed and miserably drilled, and the guns more or less unserviceable.

The state of education was, as might be supposed, extremely backward. In Gwalior and Indore and some other States, schools and colleges had been established; and in a few States—notably Bhopál and Dhár—a commencement of female education had been made. But, as a rule, “education,” except as a means of procuring livelihood as clerks, or shopkeepers, or priests, was not appreciated in Central India; on the contrary, many of the rulers regarded it as undesirable and objectionable; so that whatever advance was made was the result of pressure from without, or, in the case of Gwalior, through the influence of the great Dinkar Rao, Sindhia’s late minister.

The revenue, as is usual in native States, was raised chiefly from the land, sometimes by division of the crop, sometimes by cash assessment. Except in Gwalior, where (thanks to Dinkar Rao) liberal assessments of land revenue had been granted for terms of years; in Bhopál, where the Rulers had been amenable to advice, and in those of the States which were, or had been, under British management, the demand was uncertain and generally excessive; sometimes collected by unscrupulous farmers of the tax, sometimes by officials ill-paid and consequently oppressive. The general principle of taxation was that the State, as lord of the soil, should “take all that it could get”. The income from land revenue was supplemented by receipts from innumerable cesses, a tax on spirits, and by cus-

toms and transit duties of a particularly vexatious character.

Trade, as might be supposed, was much hampered by bad roads and even more by the intricate net-work of customs-lines, which caught the unhappy merchant at every turn; nevertheless in Málwa there was a brisk traffic connected with the manufacture and export of opium and cotton, and the import of English piece-goods; there was a valuable general trade in Gwalior; and Bhind was a busy cotton mart; in Bundelkhand and Baghelkhand the traffic was chiefly local; but in Rewah there was much demand for timber for railway purposes, and the diamond mines of Pannah attracted to it jewellers and merchants who trade in precious stones.

With regard to public improvements there had been considerable activity in respect of those in which imperial interests were concerned—that is to say, in the case of military works in the twelve cantonments or stations in which the British forces were located, and the construction of main lines of communication designed to open up the country. The Grand Trunk Road from Bombay to Agra, 446 miles of which passed through Central India, had made good progress. The great Deccan Road, connecting Mirzapur with Jabalpur, was being bridged and metalled. And new roads had been projected or commenced through Bundelkhand, connecting Gwalior with Etáwah on the north and with Jabalpur on the south, Saugor with Banda, Banda with Sipri.

These works, being more or less imperial in character, were planned (for the most part) at head-

quarters and all the Indore Resident could do was to suggest and criticise, and exercise a general supervision over some portions of the lines running through Central Indian territory ;—but even this privilege was denied to him with regard to other portions ; for the northern portion of his charge was, for imperial public works purposes, under the Government of the North-West Provinces, and the south-west portion under that of Bombay. This anomalous arrangement was obviously objectionable and before Meade's term of office was concluded it was remedied—all public works executed in Central India being placed under the control of the Governor-General's Agent.

But there was much to be done in promoting and carrying out—at the joint expense of the Imperial Government and local funds and the Native States interested—the construction of “feeders”—that is roads connecting main lines or railways with adjacent towns and marts, and providing both trunk-lines and feeders with staging bungalows and rest-houses.

For all these departments of his work Meade's early training and engineering studies admirably fitted him, and he entered upon them *con amore*.

As for the States and their Rulers, the principal State, though not the largest in area, was Gwalior, with an army of about 5000 infantry, 6000 cavalry, 600 gunners, and 163 serviceable guns; besides armed and drilled police battalions of nearly 4000 men. Gwalior and its chief have already been described. The enlightened system of administration established by Dinkar Rao was still nominally in force, but the estrangement between Sindhia and his late minister still continued with disastrous results. There was a decided falling off in the administration and the police in the Málwa portion of the territory was far from efficient. But Meade's successor at Gwalior, Colonel (afterwards Sir Henry) Daly, was the right man for the post—able, resolute and cheery, and could be trusted to do all that was possible to stimulate improvement. Sindhia himself was on the best of terms with Meade and anxious to please the Government of India; but he was deeply disappointed at the delay which had occurred in handing over to him the Gwalior fortress which had been captured from the rebels by Sir Hugh Rose's force; and the size of the new army and its concentration at Gwalior were subjects of anxiety.

Next to Gwalior the most important State in the agency was Indore. Its territories are far less extensive than those of Sindhia, but like his very scattered and intermixed with those of other chiefs. In size it



H.H. TUKOJI RAO HOLKAR,
Mahārāja of Indore.

is about as large as Wales and has a population of 1,000,000. There was an army of 5600 infantry, 3000 cavalry, and 24 guns—but far less efficient (for good or evil) than that of Sindhia.

At the time of Meade's advent the Government was centred in Mahārāja Tukoji Rao Holkar, a chief with a good English education, not wanting in ability, and given to spasmodic bursts of energy; but, as a rule, inert, jealous of his power and opposed to all reform. In short, a far from promising subject for the "friendly influence" of a "political". His loyalty in 1857 had (to say the least) been less conspicuous than that of other chiefs, and he had consequently received no increase of territory like his neighbours, Sindhia and Bhopál. This was a standing grievance which did not improve a disposition not naturally contented. But, though a doubtful friend in need, distrusted by his neighbours, disliked by his subjects and difficult to move, he had, at least, one redeeming virtue; he kept a tight hand over his officials and promptly punished any oppression or peculations proved against them. Upon the whole, therefore, the administration of his territory, though open to criticism, was better supervised and more efficient than in most of the States.

At the time of Meade's appointment Holkar's relations with the Government of India were friendly, but there were serious differences with the Bombay Government in respect to the final settlement of territorial exchanges agreed upon in 1861, and constant bickerings and disputes with the Gwalior Government in regard to land in Jhabúa on the western border.

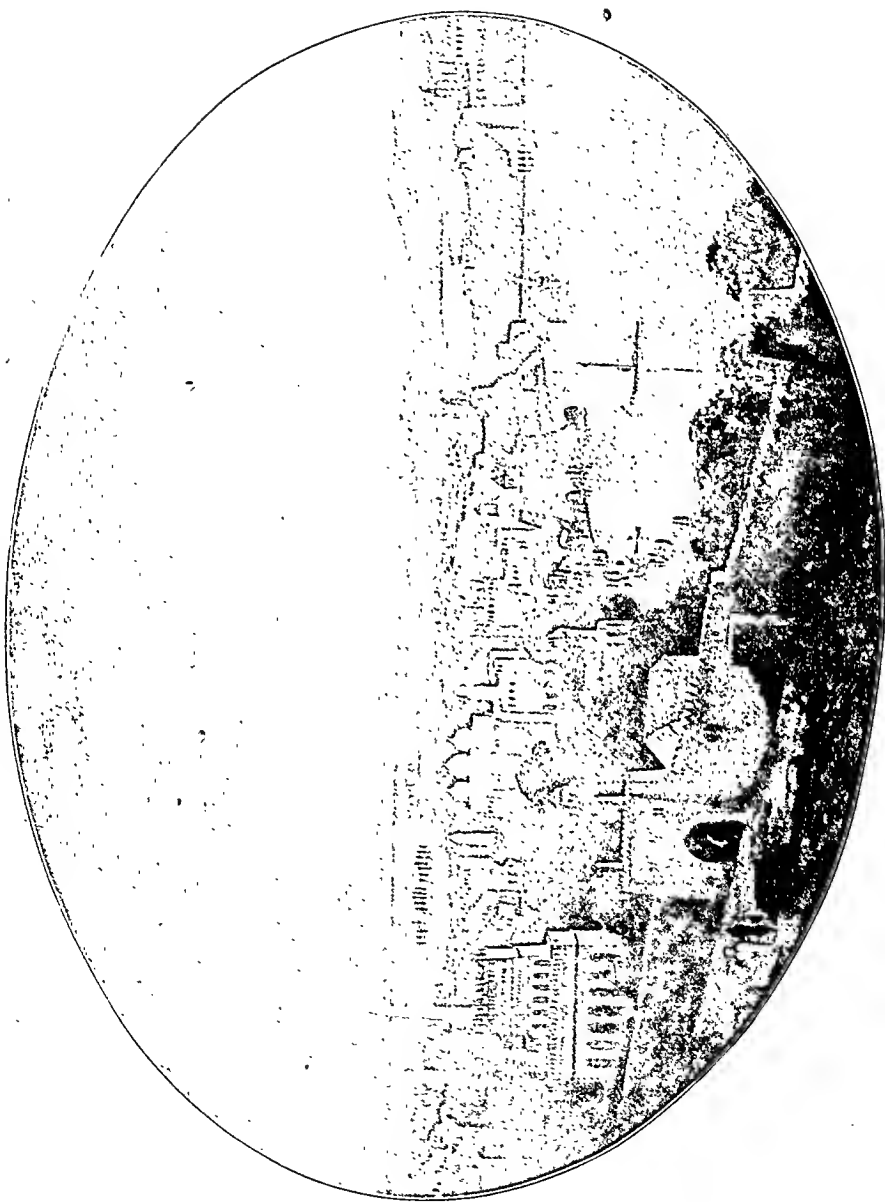
Bhopál is, next to Hyderábád, the most important

Mussulman State in India, with an area not far short of Holkar's, a population of nearly 1,000,000, and a military force of about 2000 infantry, 8000 cavalry, and 69 guns. Its ruling family is Afghán, descendants of Dost Muhammad Khan, a distinguished officer of the Mughal Emperor Aurangzeb, and it was represented at the time of Meade's appointment by Shah Jahán Begam, the daughter of Sikandar Begam, G.C.S.I., who, after the death of her worthless husband in 1844 and the usual family dissensions, was appointed Regent by the British Government in 1847.

Under the advice of a former Agent, Sir Robert Hamilton, she had introduced an excellent system of administration, and both mother and daughter proved themselves staunch friends of the British Government in 1857. In recognition of her services the mother was appointed a Knight Grand Commander of the Star of India, and Bhopál received an assignment of territory confiscated from the neighbouring State of Dhár which had rebelled.

Owing to the loss of experienced officials there had been latterly some falling off in the administration, and there were difficulties in the management of the newly assigned territory in regard to which the advice of the Agent was required; but there was no serious cause for anxiety and the relations of both the Regent and her daughter with the British Government and its representative were of the most cordial character.

The condition of Rewah, the fourth of the principal native States of the Agency, situate to the east of Bundelkhand, was far from satisfactory. The Chief was intelligent and well-disposed but inert and under evil



BHOPAL.

consequence of the minority or incapacity of their chiefs. In their case the change was great. The revenues were increased, not by increase of taxation, but by just treatment of cultivators and repression of speculation; all extravagances stopped, debts paid off, roads constructed, and order and system introduced in the place of chaos, so that when the chiefship was restored, the new ruler might at any rate start well.

One small territory—that of Mánpur—belonged to the British Government and was administered under the direct orders of the Political Agent of Western Málwa. It was admirably managed in Oriental fashion, not anglicised, and thus served as a model for other States in the vicinity; and was a subject of the greatest interest to Colonel Meade.

Such is a brief description of the condition of affairs when Meade took over the duties of Governor-General's Agent for Central India. Though there were, for the time being, no burning questions to be dealt with, there were multitudes of minor ones requiring attention; in addition to the more important matters noted above, there were plenty of misunderstandings between neighbouring chiefs; an unusually large crop of boundary disputes¹—the result of three years' absence of

¹ On Meade's accession to office upwards of 200 cases were awaiting settlement. In 1862 a code of rules was issued for the amicable settlement of these disputes by mutual agreement, or, failing that, for their judicial settlement by a boundary commission; for the demarcation of the boundary; the erection of pillars and their preservation; the punishment of the States whose subjects infringed the settlement, and appeals from the decisions given. These rules form the basis of others passed in 1877 and at present followed in settling disputed boundary cases in Central India and Rájputána.

control—and not a few domestic quarrels in which the female members of the chief's family not infrequently bore an important part. Then arrangements had to be made for the education of chiefs who were minors and the administration of their territories, while portions of the western frontier between Indore and Rájputána were more or less disturbed, requiring joint action by the Governor-General's Agents for Rájputána and Central India to preserve the peace.

This part—the most important though perhaps the least showy part of the Agent's work—involving daily references from subordinate officers from all parts of the Agency, frequent interviews and correspondence with the Ruling Chiefs or their representatives, much marching during the cold season, and careful local inquiries, was indeed no sinecure. But it was far from all. There was in addition frequent confidential correspondence with the Viceroy and Foreign Secretary on political matters of importance; official correspondence with Government departments; the control of public works; the supervision of the opium department at Indore, where upwards of Rx. 2,000,000 per annum were collected for the British Government in the shape of export or transit duties on the drug; and lastly his work as final court of appeal in judicial cases, civil and criminal, arising in cantonments or on the line of railway, or in territories under British management, or in cases of heinous crime in mediatised States.

From the above sketch it will be seen how vast and important was the field of work before him. How it was discharged during Meade's eight years of office and with what result will be the subject of the next chapter.

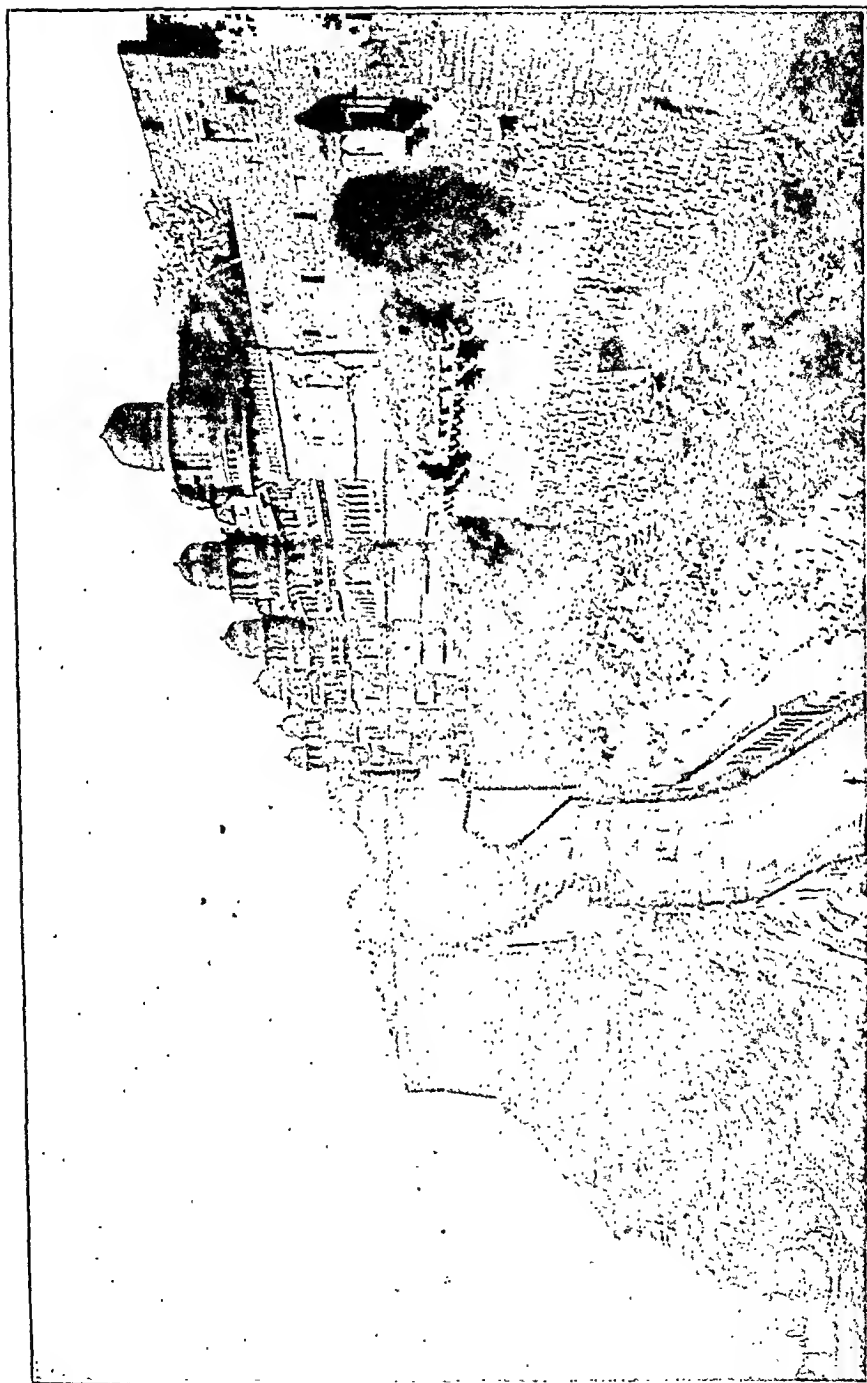
CHAPTER X.

WORK AS GOVERNOR-GENERAL'S AGENT FOR CENTRAL INDIA (*continued*).

Question of the restoration of the Gwalior fortress—How nettled—Reduction and distribution of Sindhia's troops—Correspondence with Sir John Lawrence—Meade's successful action highly approved of—Attempts to effect a reconciliation between Sindhia and Dinkar Rao—Their partial success—Sindhia's friendly feeling to Meade—Difficulties with Holkar—The "shoe question"—His aggressive conduct in reference to the Bhils—Impracticability in the case of boundary questions—Nevertheless continues to be on the best terms with Meade—Speech at a banquet in 1880—Administrative progress of the States of the Agency during the period of Meade's term of office—Meade's general policy—Roads and public works—Police—Administration of justice—Revenue system—Transit duties—States under British management—Ratlám—Barwáni—Their condition contrasted with Sailána, which had been restored to the chief's rule—Meade's testimony to the comparative benefits of British and native rule—Remarks of the Government of India on Meade's Administration Report—Results of Meade's work in Central India summed up.

ONE of the first of the political problems to be dealt with by Meade was the delicate question of the Gwalior fortress, to which reference has already been made.

The fort had fallen into the hands of Sindhia's rebellious troops, but had been stormed and captured by Sir Hugh Rose's forces, and was retained by the British Government. When, however, the negotia-



THE GWALIOR FORTRESS.

tions were going on which ended in the Treaty of 1860, Lord Canning gave Sindhia the conditional promise that the fort should be restored to the Mahārāja "when this could safely be done"; and this promise was repeated by Lord Elgin. But the military authorities were strongly of opinion that it would be unsafe to allow the fort to be occupied by Sindhia's troops—who might go out of hand as they did in 1859—so long as Morár, in its immediate vicinity, was occupied by our troops. Endeavours were made to find some other suitable locality for the British troops, not commanded by the Gwalior fort, but without success. Meanwhile, as time went on, Sindhia became impatient and vexed, and Sir John Lawrence, who had succeeded Lord Elgin as Viceroy, placed himself in confidential communication with Meade, suggesting that Sindhia should waive his claim for the immediate restoration of the fort, receiving some other boon in compensation.

The matter was a delicate one and required much care and patience to arrange. At length, however, Meade was able to induce the Mahārāja to agree to the continued occupation of the fort by British troops on condition that his flag should fly on the ramparts and that he should be saluted from its guns; and that if ever the British troops should be withdrawn his own should be permitted to re-enter. The Chief was further allowed, in recognition of his loyalty, to increase his artillery by twelve guns.

This solution of the difficulty much gratified the Viceroy, who wrote to Meade on the 1st March, 1864: "I am much obliged to you for the successful manner

in which you have brought this affair to a right conclusion".¹

Another matter of difficulty was this :—

Sindhia had for some time evaded the terms of the treaty, under which the strength of his army was restricted, by the enrolment of corps of *najibs* or "gendarmerie," nominally as police, but, to all intents and purposes, a military force; and had a mania for massing all his troops at the capital—a most unwise proceeding considering their liability to mutiny—which had already, on two occasions, almost lost him his throne and life, besides being a standing danger to the peace of the empire.

The Supreme Government, though cordially recognising Sindhia's loyal services and most unwilling to wound his feelings, felt it absolutely necessary to intervene and require (1) the disbandment of the police battalions as an organised force and the substitution of a local police, and (2) the distribution of the troops throughout the territories in lieu of their concentration at Gwalior.

The unpleasant duty of communicating and securing compliance with these requirements devolved on

¹ Sindhia still buoyed himself up with the hope that Morár would be abandoned and the fortress restored to him; and this was ultimately the case, but not till 1886. It was then arranged that both Morár and the Gwalior fortress should be restored to Sindhia, who was further allowed to increase his army by 3000 men. *Per contra* Sindhia restored to the British Government the town and fort of Jhánsi. But when the arrangement was carried into effect, in March, 1886, Sindhia was seriously ill and died in the following June, without being able to enter the fortress he had set his heart upon recovering.

Meade, who was thus called upon to press firmly upon a high-spirited Marátha chief two measures utterly distasteful to him, which affected (in his view) not only the dignity and honour of his State, but his own special hobby of commanding large bodies of troops and great military displays. To do this without mortally offending Sindhia and straining the friendly relations between Gwalior and the British Government was a work of great difficulty.

For the work, however, the Government of India could not have had a better instrument than Meade, and no one knew this better than Sir John Lawrence. Writing in October, 1865, he said :—

“ I am quite sure from what I have seen of your acts that, when it is necessary to interfere, you will only do so in a conciliatory manner, without trenching upon the just rights of the Mahárāja. But when His Highness, as in the case of the *najibs* or in other matters, acts in contravention of the Treaty and sound policy, prompt interference becomes unavoidable.”

Correspondence and discussions went on until 1867. Meade, while faithfully carrying out his instructions, took care to place fully before the Government all points in Sindhia's favour, and was able to suggest modifications in the proposals calculated to make the measures less unpalatable.¹ But the Government was

¹ One of the suggestions made by Meade is deserving of special record. He remarks in a letter to the Viceroy that the “ bitterness of the pill ” would be greatly softened in Sindhia's case if the British Government would do the Chief the honour of occasionally brigading his troops, or a selected portion of them, with the British forces at Morár. The suggestion was not approved of at the time, but it contained the germ of a great policy afterwards adopted,

firm, and rightly so, in insisting upon, the main points, *i.e.*, a full compliance by Sindhia, in spirit as well as letter, with treaty requirements regarding his troops and arsenal.

Meade, meanwhile, took the precaution of making the path of Sindhia's duty easy. The matter was dealt with at personal interviews and by confidential communications, so that Sindhia's own officials were ignorant of what was in contemplation, and it was open to the chief to issue the necessary orders, as if *proprio motu*, and not under pressure from the Paramount Power.

At length, in March, 1867, Sindhia yielded. The *najibs* were broken up and the troops distributed according to the wishes of the Government of India, and a standing danger to public tranquillity removed.

To the breaking up of the police battalions little objection was offered, but the removal of two-thirds of the troops from the capital was a sore trial. But, under Meade's influence, Sindhia met the British Government in a kindly spirit, and accepted the situation with dignity; and he was, in a measure, comforted by receiving from the Viceroy a letter expressing appreciation of the Mahārāja's loyalty, and adding that "nothing but a sense of the paramount necessity for the measure would have led the Viceroy to press for it so strongly," and that "by his compliance the Mahārāja had established a strong claim upon the good will and

which has led to the establishment of "Imperial Service Corps" in the armies of feudatory chiefs. At the present time five Imperial Service Detachments from the armies of the chiefs are brigaded with our troops and co-operating heartily in the defence of the British frontier. (October, 1897.)

friendship of the British Government," all which was duly endorsed by the Secretary of State for India.

Meade, as may be supposed, received the thanks of the Government and established his position as a Political Officer of the first rank.

Another matter of importance dealt with about this time was an endeavour to effect a reconciliation between Sindhia and his able and patriotic minister Rájá Sir Dinkar Rao, K.C.S.I. Since his dismissal from office the latter had further incurred Sindhia's displeasure by absenting himself from a *darbár*, at which the chief had announced his adoption of a son, and in consequence the *jágír*, which had been conferred upon him in recognition of his services, was resumed and a sentence of exile from Gwalior passed upon him. The reconciliation was effected to some extent. The *jágír* was restored and the ex-minister was permitted to return to Gwalior. But he was never re-employed, and on his deathbed Sindhia specially desired that Dinkar Rao should have nothing to do with the administration of his territory. A regrettable episode, but not without precedent in European history.

We have been somewhat anticipating events, but it seemed desirable to complete the history of Meade's personal relations with the great Marátha Chief. Let it be added that Sindhia retained to the last the warmest friendship and respect for Meade as well as gratitude for the service he had rendered in days gone by ; and after Sindhia's death his successor, then a bright and promising youth, in reply to a letter of condolence, speaks of Meade as one of his father's " old and sincere friends ".

With Holkar there were difficulties, but none of a very serious character.

His first difficulty involved the celebrated "shoe question".

Holkar (unlike Sindhia) insisted, or, at any rate, tried to insist, upon the strict observance of Oriental customs at his court. His hall of audience was, ordinarily, unprovided with chairs, and the Resident and his suite, on paying an official visit, were expected to divest themselves of their boots in the vestibule, and on entering the presence-chamber to make profound obeisance (*kormish*) to the Ruling Prince as he reclined upon a cushion (*gadi*), and then to seat themselves cross-legged upon the ground beside him.

In the days when the East India Company was a mercantile body, seeking to obtain from native princes concessions of trade privileges or territory, such conformation to Eastern usage, however humiliating and even painful, may have been expedient; but when the Company ceased trading and the British Government assumed the position of Paramount Power of India it was entirely out of place.

It was also unreasonable.

An Indian Prince is allowed to pay respect to the Queen's Viceroy in Oriental fashion—by removing his shoes without removal of his head-dress. If so, the representative of the Viceroy can reasonably claim the right of paying his respects to an Indian potentate in English fashion, by taking off his hat without removal of his shoes.

But customs die hard, and the old form of ceremonial still lingered at Indore and in the court of the Nizám.

During his brief tenure of office as Indore Resident Colonel Durand declined to submit to the humiliating ordeal, but his successor, Sir Richmond Shakespear, was more complaisant.

Accordingly, when Meade and his suite presented themselves for the first time, on his appointment, no chairs were provided, and he and those accompanying him had a very *mauvais quart d'heure*.

But this was the first and last occasion. Meade courteously but firmly declined a repetition of the unpleasant operation, and insisted that, in future, chairs should be invariably provided for the Resident and those accompanying him.

There was much correspondence, but ultimately Holkaryielded—and the old ceremonial of obeisance and squatting has been long a thing of the past (in the case of British officers), not only at Indore, but even in the still more strait-laced court of the ruler of Hyderábád.¹

¹ Another phase of the "shoe question" was for many years a cause of much difficulty and disquietude in India, *viz.*: how far was the half-anglicised Indian to be excused from compliance with the ordinary forms of Oriental respect? Members of the Young India party were prone to wear tight-laced boots incapable of easy removal, and at the same time objected to remove their head-dress—a proceeding which often led to unpleasant altercations. At length the question came before the Viceroy in connection with the regulation of ceremonial at *darbárs*. The knotty point was solved by the Viceroy (Lawrence) thus: It was decided that, if a native of India so far conformed to English notions of respect as to wear *patent leather shoes*, he should not be required to remove them, and, at the same time, should not be required to remove his head-dress. The decision caused much grumbling, and was, perhaps, not very logical, but it had the merit of settling a much vexed question. It has prevented unpleasant altercations, has done no harm to any one, and has greatly benefited the manufacturers of patent leather.

But there were more serious difficulties than "shoe questions". Holkar had to be curbed in his desire to assume sovereignty over two independent Bhíl chiefs or Bhúmias,¹ of Jamnia and Rájgarh; a proceeding in which His Highness was aided by the clever advocacy of his new minister, Sir Mádhava Rao.

Pressure had to be put upon him to do justice to another Bhíl chief, whom he nearly drove to desperation by withholding for years dues payable for the protection of passes in the Sátúra range. After some years of correspondence Holkar ultimately paid the amount due.

In 1861 it was deemed desirable, with the view of making the British boundary compact, to enter into negotiations with Holkar for the mutual exchange of territory—Holkar ceding some scattered villages in the North-West Provinces and Deccan, and receiving land of equal value on the Bombay border. Boundary commissioners were appointed and transfers of territory effected from time to time; but "owing to difficulties raised by Holkar the negotiations were protracted throughout the whole time of Meade's tenure of office, and were not finally concluded until 1880, when a boundary was at length fixed to the great advantage of Holkar. But he was dissatisfied.

In 1864 it was deemed expedient to demarcate the boundary between Holkar's territories south of the Narbadda and the Bombay district of Khandeish—in accordance with the treaty of 1818. This was done after searching inquiries by two British officers, whose decision Holkar promised to accept. Holkar

¹ Alluvial proprietors.

was dissatisfied and appealed to the Supreme Government. The Supreme Government upheld the award. Holkar was aggrieved. At length, on the occasion of the Imperial Assemblage of 1877, Lord Lytton's Government agreed, as an act of grace and with a view of removing all possibility of complaint, to enlarge Holkar's boundary by the grant of 360 square miles of British territory in Khandeish. Holkar received this generous gift and—was dissatisfied; because he hoped to have got more.¹

There were other boundary cases between Indore and the neighbouring States, notably one with Dhár, in which Holkar's claim had to be rejected.

In 1859 Holkar offered the British Government a loan of £1,000,000 for the construction of a railway at Indore. This was accepted and a railway has been made. But Holkar was dissatisfied because he was not allowed to levy a tax on the materials used for the railway.

All these cases caused a good deal of trouble and required much patience to adjust; but in spite of his having to decide them unfavourably for Holkar, Meade's relations with that Chief were, up to the last, of a most cordial character. In 1880, ten years after Meade had left Indore, Holkar entertained him at a banquet, and in a speech delivered on the occasion referred to Meade as "his oldest friend in India," and described him as one who "was popular with the Government he served and popular with the States to which he had been accredited". He continued to

¹ It is fair, however, to state that Holkar's successor, the present Mahārāja, expressed to the writer the warmest gratitude for the grant of territory referred to.

proportion of the total area for which protection is required; and for the extensive areas that cannot be commanded in this way, reliance will have to be placed on a system of storage tanks. Laying aside for the present all questions of the subsequent demand for water and of the probable financial results, the conditions, especially in the rice districts, are exceptionally favourable for the construction of these works. The general configuration of the surface lends itself to the storage of water; and the rainfall is, as we have shown, usually abundant, and but little liable to severe fluctuation in total annual amount. In the Wainganga districts, where 44 per cent. of the rice area is irrigated, these advantages have already been largely utilized. In Chhattisgarh the work of storage has not proceeded so far, but, as already stated, 9 per cent. of the rice area depends on tank irrigation, direct or by percolation. The tanks, being private works, will be referred to in detail later on, but as their existence will have, in many cases, an important influence on the design and working of any Government tanks that may hereafter be constructed, it is necessary to make a brief reference to them here. They are generally small tanks irrigating on an average, according to the statistics supplied to us, 10 to 15 acres each. But this average has been obtained by including a large number of mere ponds; and the embanked tanks are, as a rule, much larger than this average would seem to imply, many of them protecting some hundreds of acres each. Their function is to store the rainfall and protect the rice crop from failure when the rain ceases prematurely, or when its fall is badly distributed. But, being small and shallow, they are liable to fail in very dry years; and, even in years when the rains fail only partially, many fields which are returned as irrigated receive a very insufficient supply of water. Nevertheless, these tanks were of great protective value during the famine of 1896-97, when the early rains were copious but the later rains failed. The use of wells to supplement the tanks' supply is unknown, except in the Sambalpur district where they are used to a very small extent.

339. *Necessity for large storage works.*—For the full protection of the rice districts it will be necessary not only to provide tanks in greater numbers, but also to ensure them a supply of water in the driest year. To arrive at anything approaching this latter condition, much larger tanks than those hitherto made will be required, and in nearly all cases it will be necessary for the State to undertake their construction. The only large tanks at present in existence were made many years ago by the farmers of the land revenue, who had a free hand and were not hampered by the rights of their neighbours or tenants.

340. *Provision against a year of drought.*—Even the largest tank unless river-fed will, however, be dependent on the local rainfall; and in most parts of India all purely rain-fed tanks, however large, are liable to failure in a dry year. But in this respect the conditions in the Central Provinces are exceptionally favourable, more so perhaps than in any other tract outside the limited areas of really assured rainfall. The rainfall is usually abundant, and in most years only one or two waterings are required for the autumn crop; there is no winter crop of rice; and the moisture remaining in the soil after the autumn rice has been harvested is sufficient to bring to maturity the second crop of *rabi*, which is usually sown only on low-lying lands. Moreover, it has to be remembered that famine in the Central Provinces may result not merely from very short rains, as in 1899-1900, but from an abundant, or even excessive, rainfall which ceases prematurely, as in 1896-97. In such a year as this all tanks will be full to repletion, and will be of the utmost value in saving the cultivation supplied from them. Such droughts as 1899-1900 are not likely to occur more than once or twice in the century. Nevertheless in the projects which have been prepared for new storage works, the object of affording protection throughout a period of drought as prolonged and severe as any on record, has been steadily kept in view. Whether that object is likely to be fully attained is a question which, as the conditions are peculiar, can only be settled satisfactorily by actual trial. The estimates of the Engineers as to the area that each work will protect have, however, been framed with caution, after a careful examination of the records of rainfall for the past

33 years ; and we see no reason to think that they will prove unduly sanguine. The tanks, we may note, are designed generally to hold 25 per cent. more than the estimated run-off in a year of average rainfall. This probably allows as large a margin as can reasonably be afforded.

341. In the detailed projects which have been laid before us the area proposed to be irrigated in an ordinary year is generally but little in excess of that for which, according to the calculations, water would be available in a year of drought. This arrangement has been the subject of a good deal of discussion. The objection has been raised that it will not admit of the water being used to the best advantage in years of sufficient but badly distributed rainfall, such as occur so frequently in the Central Provinces. This is no doubt the case ; but, on the other hand, it is contended that no one can foretell at any moment how the rest of a season will turn out, and that it is necessary to limit the area watered at any time to that which could be matured by the volume of water available in the tank in the event of a subsequent failure of the rains. It will undoubtedly be necessary sooner or later to fix some limit to the area entitled to water from any work ; and we have no objection to urge to the provisional limits on which the estimates are based. But we think that they should be regarded as provisional only, and be subject to modification hereafter as experience is gained of the real irrigating capacity of the works, and of the best methods of management.

342. *Projects for storage works, their cost and scope.*—At the time of our visit nearly 200 projects were in various stages of preparation, for storage works in the rice-growing districts ; the capacities of the works varying in size from a small tank to hold under 10 million cubic feet and irrigate 70 acres, to the large Ramtek reservoir designed to contain 4,564 million cubic feet and protect over 50,000 acres. Their average capacity is about 300 million cubic feet. For 42 of the projects the plans and estimates had been worked out in full detail, while the remainder had been investigated in sufficient detail to give an approximate idea of their protective capacity and cost. Many of these projects are in their present form too expensive in relation to the area to be protected, to justify their construction as ordinary works ; but in the event of a famine they would provide an excellent programme of works for the employment of relief labour. Taking all the projects which have been brought forward, as a whole, it is estimated that they would protect 450,000 acres of rice at a cost of about 3 crores of rupees, or at the rate of about Rs. 67 per acre. This exceptionally low rate for storage works is only rendered at all possible by unusually favourable conditions of rainfall, and by the small number of waterings likely to be required. At present, out of 5,000,000 acres under rice, about 550,000 acres are returned as irrigated in ordinary years, and about half that area in years of severe drought. The construction of the proposed works would increase the area irrigated in an ordinary year to 1,000,000 acres, or to 20 per cent. of the whole rice area ; and, if the calculations are correct on which the areas that can be fully protected are based, the area irrigated in a year of drought would be increased to 685,000 acres, of which 400,000 acres would be irrigated by the new works.

343. *Further scope for projects.*—This programme is far from being exhaustive. Many tracts have not yet been examined, and it is said that in all the rice-growing districts there is a large field for the extension of tank irrigation outside the scope of the projects which have so far been examined. There are no doubt some places where storage works would involve the permanent submergence of large areas of valuable low-lying lands which seldom fail to produce a crop. From a protective point of view the benefit to be derived from the work in such cases may sometimes fail to counter-balance the damage done. But, speaking generally, the only limit to the percentage of rice cultivation that can be protected in a year of drought would appear to be that imposed by considerations of cost.

344. *Water-rate likely to be realized.*—The works themselves, compared with similar works in other provinces, will not be costly to construct, but they

can scarcely be given to the province as a free gift, and their maintenance will entail a large annual expenditure. There is no doubt as to the utility of the works, nor as to their comparative cheapness of construction, even though it may not be found possible in practice to work to such a low rate per acre as the estimates indicate. The only question is, will the people be willing to pay a fair amount for the use of the water, so that its provision may not throw an unreasonable burden on the shoulders of the general tax-payer of the country? On this question we have heard various opinions; but the evidence of Mr. Sly, and of other competent witnesses, points to the conclusion that the people may be willing, eventually, to pay for effective protection an annual rate averaging Rs. 2 per acre on the whole area protected. This is the rate upon which the estimates of the financial returns of the projects have been based, although it is admitted that such a rate cannot be realized for some years to come, except perhaps in the Wainganga districts where the value of irrigation is already fully appreciated.

345. Water rates similar to the occupiers' or owners' rates which are leviable under the Northern India Canal and Drainage Act (VIII of 1873) would not be suitable, except as a purely provisional arrangement, for the works which we now propose, as these rates can be levied only on the areas actually irrigated. On these works, however, it may be anticipated that the cultivators will in favourable years abstain from taking water at all. In the case of a number of existing private tanks there are many seasons in which water is not drawn off, but is carefully husbanded for use in the next season or period of severe drought. The practice is one to be encouraged; but it is incompatible with a permanent system of water rates which would only be paid in years of active demand. The most suitable form of irrigation revenue would be afforded by an enhancement of the land revenue assessment over the whole area protected by the works, irrespective of the area actually irrigated in particular seasons. This enhancement would follow, or be based on, the increase in rents of the protected lands, which may be expected as a result of the construction of the works. Such enhancement, however, can only be made at settlement, and after some experience has been gained of the value of the water advantages afforded by the works and their effect in raising rents. In the meanwhile some revenue may be realized by imposing an occupiers' or an owners' rate under the Northern India Canal and Drainage Act, which applies to the Central Provinces; although such a rate can only be charged for any particular crop on the lands actually taking water. In the Wainganga districts a reasonably high rate might probably be charged as soon as water has been made available. But elsewhere the people will certainly require some education in the value of irrigation before they can be induced to pay even a low water rate; and we think that it will be advisable in such cases to give the water free of charge for two or three years, subsequently levying a small occupier's rate on the area actually irrigated. Eventually, when the irrigating capacity of the work and the value of the protection afforded have been tested by experience, it may be advisable to allow the land-owners to compound for this rate by an annual payment, to be made for a convenient number of years or until the next settlement; but it is doubtful if the full value of the water will ever be realized until the first or second revision of settlement following the completion of works. Water rates would of course always be charged when water is supplied to lands outside the protected area. A scale of charges may also be required for filling private tanks.

346. *Supply to existing private tanks.*—In certain cases it may be possible, in years of scanty rainfall, to supply private tanks with water from Government works, if the owners agree to pay a suitable annual contribution. In fact, in some cases, where a considerable portion of the area commanded is already irrigated from small private tanks, this must be the chief function of any Government work; and whenever the Government tank prevents water reaching tanks lower down in the catchment area, the supply to such tanks may have to be given gratis.

347. *Experimental works recommended.*—It is necessary to insist on the fact that, although a considerable extension of tank irrigation is practicable in many parts of the Central Provinces at a comparatively moderate cost, the great

obstacle is the unwillingness or inability of the people to pay for insurance or protection against famine. The land revenue rate of assessment is so low that even a moderate water rate must seem high in proportion, and the cultivator may be expected to try to do without water altogether, except in years of extreme drought; and these fortunately are of such infrequent occurrence that the irrigation revenue must at first be very precarious. Even when, in course of time, the advantages of protection are fully recognized and paid for, it is doubtful whether the net revenue derived from the works will yield a return of much more than 1 per cent. of their capital cost; because protection itself is so seldom needed. The justification for any expenditure that may be proposed will not be found in any prospect that it will prove remunerative, but in the fact that it will afford material protection against the cost and misery of famine. We do not think that the net cost of this protection will be unreasonably high if the present estimates of the areas to be protected by the works, and of the returns to be derived from them, are fairly correct. Their correctness, however, can only be determined by actual experience; and in order that this may be obtained with as little delay as possible, on the completion of our inquiries in the Central Provinces, we addressed the Government of India recommending that immediate steps should be taken to ensure the early completion of certain works, some of which had been partly constructed as relief works during the recent famine, so that experience might be acquired on a sufficiently large scale in both the transplanted and broad-cast rice districts. We have heard with satisfaction that estimates for six of these works, aggregating over 18½ lakhs, have since been sanctioned, and that funds have been provided for their execution. But we strongly recommend that more works be put in hand as these approach completion. In addition to the questions of the extent of area that can be protected by each work, and of the water rates which the cultivators will be willing to pay, there are many other important matters connected with the design and management of the works, and with the distribution and control of the water, which can only be settled by actual trial. One of these has already been referred to in paragraph 341. It is impossible to reason from the analogy of similar experience elsewhere; in no other province are the conditions at all similar. These experiments should be carried out boldly, continuously, and systematically, on an extensive scale in different districts and under varying conditions, even although it is certain that the expenditure will not be remunerative. Until they have been made, it can never be said with confidence either that adequate protection of these tracts at any reasonable cost is impracticable, or, on the other hand, that Government would be justified in embarking on any more extensive programme of tank construction in the Central Provinces. It is difficult to propose a limit to tentative expenditure of this kind; but we think that no final conclusion on the value of such works in such a country can be arrived at until at least fifty lakhs have been devoted to their construction.

348. *Wheat tracts.*—The experiments should not be confined to the rice districts for which most of the projects have so far been prepared. There are possible projects for tanks in the northern districts which, if constructed, would either irrigate existing rice or enable rice to be cultivated; and both in the northern and western districts there are possible tanks to irrigate wheat on the lighter varieties of wheat land. Experiments in these tracts will be useful as showing to what extent the construction of Government works would be justified; they may at the same time afford an object lesson as to the advantages to be derived from such improvements, and encourage the more enterprising landowners to carry out similar works at their own expense. There is probably some scope for the construction of tanks outside of the Wainganga and Chhattisgarh districts; but no individual will be willing to lay out capital on such works until he has some means of judging of their utility. The risk of making the experiment is, we think, one which the State should incur.

349. *The Lachera tank.*—There is one existing storage work in the Nimar district from which it may be possible to gain some experience as to the value of such works in the wheat-growing tracts. The Lachera tank is an old work which was repaired in 1845 by famine labour, and subsequently handed over to the District Board. The work has been allowed to fall into disrepair during

a series of wet years, and we understand that the high rates charged for water have discouraged its use for irrigation. The tank is situated in a tract of which the soil resembles that of the Nerbudda valley, so that it is perhaps not very favourably situated for experimental purposes. But we learn that since our visit to the province the tank has been taken over and repaired by Government, that 120 acres are being irrigated, and that the people are paying water rates of Rs. 4 for wheat lands and Rs. 6 for sugar-cane, in addition to the rent which they pay to the landlord.

350. *The Ramtek project.*—Of the schemes which have been laid before us, the most important is that for the utilization of the water of the Pench and Kanhan rivers and the construction of a large reservoir on the Pench river, opposite the town of Ramtek. In paragraph 328 we have already referred to the various projects which were prepared many years ago in connection with this scheme; and we have shown how the first ambitious proposals gradually dwindled down to the small Ramtek project. Enthusiasts for irrigation have sometimes referred in sanguine terms to the great potentialities of these abandoned schemes; but the distrust with which they have been regarded in the past appears to be still entertained by those who are most competent to give an opinion. We have been struck by the fact that the local authorities, keen as they are, after the experience of the last few years, on the extension of irrigation in other tracts, are doubtful as to the advisability of carrying out the Ramtek project, which in its present form is estimated to cost not more than about 12 lakhs, and to protect some 32,000 acres, one-half of which is under rice cultivation. They admit that in addition to the rice land there is a considerable area under garden cultivation, that much of the black soil which is commanded is probably more suited for rice than for wheat, and that some of the villages did suffer a good deal during the famine. But they think that it is of far greater importance, as a matter of protection against famine, to construct storage works within the rice-growing districts, than to extend irrigation to a tract which, as a whole, was not severely distressed in the late famine, while doubts are still entertained as to whether water will be taken outside the rice area. We do not desire to recommend the construction of this work in preference to others, which, in the opinion of the revenue and local authorities, are more urgently needed for purposes of protection, but we hope nevertheless that it may be possible to take it up at no distant date. In spite of the doubts as to the suitability of the black cotton soil for irrigation, the project appears to us to involve less financial risk, in proportion to its cost, than any other that has been laid before us; and it would, if carried out, afford important and probably conclusive evidence as to the value of irrigation in certain varieties of black soil. It may be added that, if its execution should be justified either as a productive or protective work, it may be possible to proceed with some confidence with the larger and more important Pench scheme, of which the Ramtek project is but a part, but which it is impossible to recommend until experience has been gained, on a smaller but conclusive scale, as to the value of irrigation in this portion of the Nagpur plain.

351. *Completion of the projects.*—The question whether the projects should be actually carried out as ordinary public works or reserved for famine labour, can only be determined with reference to the results of the experimental works which we have recommended. But there can be no doubt as to the advisability of completing the investigations now in hand, to the extent necessary to provide a suitable programme of relief works for each district; and for this purpose it will be necessary to retain for some time the special establishment employed on the preparation of projects.

(iv).—*Private irrigation works.*

352. *Types of works.*—The private works upon which, as we have shown, the Central Provinces are now entirely dependent for irrigation, consist of tanks, river channels, wells, and field embankments.

TANKS.

353. *Number and description of tanks.*—The annual statistics do not show the total number of tanks in a district; but only the actual number used for

irrigation in each year. Taking the maximum number returned for each district during the past eleven years as representing approximately the total number of tanks in the district, there are in all about 47,500 tanks in the British districts of the province. Of these, 28,500 are to be found in the Wainganga districts, including portions of Seoni and Nagpur, and 18,500 in Chhattisgarh. The remaining 500 lie for the most part in Damoh and Saugor. Of the Wainganga tanks over one-half are in the single district of Bhandara; and of those in Chhattisgarh, one-half are in Sambalpur. Even in a favourable year the tanks of the Wainganga tract irrigate on an average under 20 acres each, and those of Chhattisgarh only about 10 acres. Thus they are generally very small in size, and, as they are in nearly all cases dependent on the surface drainage from their catchments, their supplies fail in years of scanty rainfall. In a favourable year they irrigate upwards of 650,000 acres; but in 1899 all failed except some of the largest, and the area fell to 176,000 acres of which a large proportion received only a very insufficient supply. Generally the arrangements for disposing of flood waters are deficient, and the banks are often too weak to stand a high flood. Thus, in 1896-97, heavy rain in the earlier part of the year breached many of the tanks, and the result was a great loss of water which would have been invaluable when the later rains failed.

354. In the Wainganga districts some of the larger tanks are provided with masonry sluices for regulating the distribution of the water, but more frequently the water is let into the field by cutting the bank in one or more places. In Chhattisgarh, where the tanks appear to have been made primarily for domestic purposes, only a few have masonry sluices, and the bank is seldom cut before September. In years of good rainfall, and even of ordinary rainfall if the tank is in black soil, it is not cut at all; and in all years the rice crop is said to derive its chief benefit from the water which percolates through the porous embankment. In the case of some of the larger tanks as much as 400 or 500 acres are benefited in this way.

355. *Repairs and improvement of tanks.*—Theoretically the owner of the tank is bound to keep it in a state of repair. As a rule he does so if he himself cultivates land under the tank, is on good terms with his tenants, and has the necessary means. But many of the tanks are in a bad state, particularly where the owner is not a man of means, or is a non-resident possessing a number of other villages. In the latter case he will often prevent his tenants from carrying out the repairs, lest by doing so they might acquire some right in the tank. The clause in the village record of rights which requires the owner to keep the tank in a state of repair, is seldom if ever enforced. This is, no doubt, mainly due to the fact that, until recently, the defective condition of the tanks has not led to much inconvenience. Now, when the necessity for some action in the matter is felt and recognized, but little can be done; for, owing to neglect in the past, many of the tanks would cost much more to repair than the owners can afford, and more than could be recovered by any fines which, under existing rules, may be recoverable on account of past neglect. We were informed that such fines if recovered could not, under the rules as they stand, be applied to the repair of the tanks. To fine the owners for their neglect, in such circumstances, would only have the effect of rendering them still less able to incur the necessary outlay.

356. Again, if the most is to be made of the tanks, and if they are to be made of any real protective value, many of them will require more than ordinary repairs. They must be improved and provided with proper outlets and escapes. For this the present rules make no provision; and even if they did, the owner would often not be equal to the task, or could not afford it. If in the future any substantial progress is to be made in improving the tanks, we have no doubt that Government will have to render assistance, and to contribute liberally in many cases towards the works which are now required. Arguments are scarcely needed to justify their doing so. The State derives revenue from the lands protected by the tanks and, in our opinion, lies under something like a moral obligation to contribute something towards their repair. The contribution might take the shape of a grant-in-aid or of a loan on liberal terms. In cases of

improvement Government will eventually receive at least half of any increase in the rental of the land, and might not unreasonably assist in the improvement of the tanks by contributing half the total cost. In such cases the improvement would, of course, not be exempt from enhancement. If the owner wished to bear the whole cost of the improvement, so as to secure exemption for the increased area of irrigation, Government might allow him free of charge, in consideration of the extra protection afforded, such professional aid as might be required. Once a tank has been placed in efficient repair by means of Government aid, the obligation of the landlord for future repairs should be strictly enforced.

357. This leads us to the question of the agency by which the tanks are to be inspected and improved. It is needless to say that for any inspection to be efficient it must be systematic; and that something more is required than the occasional and haphazard visit of a revenue officer. The inspecting officer must be able to take up the tanks in regular rotation; and he must have such qualifications as will enable him to state clearly what works are required when a tank is found in disrepair, and to estimate roughly the amount of expenditure involved. A small staff of Inspectors should, we think, be employed specially for the inspection of tanks. They need not be very highly trained or highly paid. An Upper Subordinate of the Public Works Department should possess all the qualifications required for the work. Whether he should work directly under the Deputy Commissioner of the district, or be attached to the Public Works Department, is a detail which may be left to the local authorities to decide; but no doubt, in all important cases, the Collector will require advice either from the District or Divisional Engineer, or from a special Irrigation Officer. For the improvement of the tanks, higher professional skill will be required to prepare the designs and to exercise general supervision over the works. This will have to be supplied by the Public Works Department; and for the present at least, the work should be carried out under the general direction of the Engineer employed on the preparation of projects for Government tanks. No time should be lost in completing the necessary surveys so as to have them ready in advance, and allow of the works being taken up in rotation, with the help of *takavi* or grants-in-aid, in ordinary seasons or in times of famine.

358. The general insufficiency of the protection afforded by these small private tanks in a dry year, may be considered a ground for objecting to the expenditure of State funds in connection with their repair or improvement. No doubt most of them will still be liable, although in a less degree, to fail in a year of severe drought like that of 1899, but their protective value in a year like 1896, which is of more frequent occurrence, will be very greatly enhanced. And where, as we trust will often be the case, their supplies can be supplemented from storage in large Government tanks, there will no longer be the same likelihood of failure in a dry year. In such cases it is essential that the tanks should first be put into good repair, and be provided with proper arrangements for controlling and distributing the water. But, irrespective of any extra supply that the small tanks may obtain from Government works, we think that money spent on them by the State, in the way we propose, is likely to yield in the aggregate as good, if not better, protective results than an equal sum spent on the construction of new works. We cannot but regard with apprehension the consequences of the continued neglect and deterioration of these useful works, and the fact that the incentives, which in former times induced proprietors to construct, improve, and maintain them, appear now to be almost inoperative.

359. *State acquisition of private tanks.*—It has been suggested that, when the owner of a tank under obligation to repair it refuses to do so, even with the help of a loan or grant-in-aid for the purpose, Government should be empowered by a legislative enactment to take over the management of the work for a time, and to receive fiducially the rentals of the proprietor from irrigated lands, from which the cost of repairs and maintenance could be met; and also that the same power could be usefully exercised in cases where the water is used wastefully or distributed unfairly, as for instance, when the owner refuses in time

of drought to give water to those who are entitled to it. Our evidence leads us to believe that the hands of Deputy Commissioners urgently require strengthening in these matters, and that the necessary powers should be given them by legislation. The mere existence and occasional exercise of such powers will probably be sufficient to induce the owners to take action when called on. We should hesitate to recommend the extreme measure suggested to us, of actually acquiring the tank and rentals dependent on it, until the less drastic measure of merely taking over the management for a time has been tried and failed. The proposed measure would, of course, not be applied to any tanks which are declared in the record-of-rights to be the private property of the *malguzar*, and for the irrigation of his private lands only.

360. *Scope for extension of private tanks.*—There appear to be many obstacles in the way of any considerable extension of private tanks, some of which, we fear, no action on the part of Government is likely to remove. Few of the landowners seem to have the necessary enterprise, even if after such a succession of bad years they have the necessary means, to undertake the construction of a tank. They may desire that Government should make tanks for them; but they show no desire to make them out of their own resources, or to take loans on easy terms for the purpose. It is disappointing to note that the grant of a fixed tenure appears to have given no incentive to improvements. On the contrary, it has removed the incentive which existed under the old Maratha rule, when improvements appear to have been made more frequently than is now the case, in the hope that a renewal of the lease might be obtained on the strength of them. Security of possession has, in fact, led to an indifference which has been intensified by the easy terms on which the lands are held. A landowner, or even a tenant, might still be willing to make a tank if he had a sufficiently large area of his own land in one block, and within command of a tank. But such cases are rare, especially in Chhattisgarh, where, owing to the *lakha bhata* system already alluded to, the holdings consist of fields of almost infinitesimal size, situated in different parts of the village. Hitherto the landowners have certainly shown but little desire to construct tanks for the irrigation of lands held by their tenants, although it is thought by some that, under the influence of recent experience, the tendency to make such improvements is increasing. When a private person does wish to construct a tank in an approved site, we think that Government might render him such assistance as we have recommended in the case of tank improvements, and that on the completion of the tank an immediate remission should be made of the revenue of the lands it submerges.

361. *Special concession for the construction of large tanks.*—As an additional inducement, Mr. Sly, Commissioner of Land Settlements, has proposed that, in the case of any large work, an immediate remission should be made of one-eighth of the assessment on the land benefited. This remission should be given for a fixed term of years, the length of which would vary with the amount of the capital expended. During this period no enhancement should be made on the existing assessment. At the end of the period one-eighth of the revenue then assessable on the land should be given as a perpetual exemption. Mr. Low, Deputy Commissioner of Hoshangabad, proposes that the concession should take the form of a revenue-free grant of a proportion of the area improved; the grant to be either perpetual or for a certain number of lives. The local authorities are the best judges of the form which the grant should take, but we think that some concession of the kind is desirable; and it would, we understand, be in keeping with an ancient custom of the province. The cost to the State would be comparatively small, while the concession would have a sentimental value in the eyes of the grantee and of his family, and would raise him in the estimation of his neighbours. It should continue only so long as the tank was kept in repair; and should not be transferable, but be personal to the grantee and his heirs.

362. *Acquisition of land.*—In order to remove one serious obstacle to the construction of private tanks, powers should be given, with such safeguards as may be necessary, for the acquisition, on behalf of the person constructing the tank, of way-leaves, or a right of occupying land required for a private tank

or for its distributary channels. This power might be conveniently given by an addition to the Land Acquisition Act, or to the Northern India Canal and Drainage Act. In some cases it may be advisable that the land should be acquired outright. But for such works as these it will generally be preferable to acquire only a right of occupation for the purpose of the work, subject to the payment of compensation; the owner of the land retaining the title, and the right to revenue in the event of the land being no longer required for the purpose of the work. Such an arrangement will usually be less costly, and, at the same time, far less unpopular than expropriation.

363. *Local utilization of the famine cess.*—Before leaving the subject of tanks, we may refer briefly to a proposal which Mr. Craddock has brought forward with the object of providing the funds required for their improvement, and for assisting in the general development of the private irrigation works of the province. At present an additional famine cess of 2 per cent. is charged on the land revenue by which about $1\frac{3}{4}$ lakhs are realized annually. Mr. Craddock proposes that this cess should be ear-marked for the improvement and development of private protective works, on the general grounds that it will ensure the allotment of a definite annual sum for this purpose, and, at the same time, fulfil the avowed object for which the cess was imposed; while the allotment of this local cess for a local object would render it more popular than it is at present. We realize the objection which may be urged, on general grounds, to ear-marking any portion of the public revenues for a particular purpose; and, provided that adequate funds are made available for the development and improvement of private irrigation works, we do not deem it necessary to express an opinion as to the form in which the requisite assignment should be made.

RIVER CHANNELS.

364. *Present restricted use and possibilities of extension.*—Channels for the conveyance of water from rivers or streams appear to be used to a fairly considerable extent in some districts; but, considering the facilities which exist in many parts of the province for the construction of small river-fed channels for direct irrigation, the area irrigated in this way is remarkably small. According to the annual returns of the areas irrigated from different sources, such channels would appear to be confined to the district of Raipur; but we gather that they are also to be found in smaller number in Bilaspur, Nimar, Damoh, and other districts. Even in Raipur, where they seem to be more popular than elsewhere, and where in 1896-97 they accounted for nearly 9,000 acres of irrigation, they are apparently used very spasmodically. Many old channels are now not used at all, owing, it is said, to the apathy of the cultivators and the weakening of corporate feeling in the village community. The granting of facilities for the acquisition of land, personal encouragement on the part of the revenue officers, the professional assistance of the Public Works Department, and the concessions recommended in the matter of loans and exemptions (Chapters V and VI) should lead to a considerable extension of this useful class of work.

WELLS.

365. *Number of wells and areas irrigated.*—There is singularly little well irrigation in the Central Provinces. In 1900-01, within the eighteen British districts, there were in actual use only 55,851 irrigation wells, and they irrigated an area of only 74,851 acres, or less than $1\frac{1}{2}$ acres per well. Sixty per cent. of the well-irrigated area lies in the five districts of Nimar, Nagpur, Chhindwara, Betul, and Saugor. Roughly, rather more than one-half of the area consists of wheat and other field crops, and the balance of sugar-cane and garden crops. Eighty per cent. of the wells are small temporary wells, many of which are mere holes in the beds of streams. In the last eleven years the number of durable wells is said to have increased from 7,688 to 14,004, or to have been nearly doubled. But it is doubtful how much satisfaction can be derived from this fact; for during the same period there has occurred a decided decrease in the total area irrigated from wells of all kinds, in contrast with the neighbouring provinces of Bombay and the United Provinces, where the area has been increasing. The districts of Saugor, Nimar, Balaghat, and Betul account for

about half the increase. The area irrigated per durable well is not easy to estimate. In Nimar it is put at 6 acres. In Saugor at 4 acres. The statistics give no help, as there are no separate figures of area for durable and temporary wells. Probably as in Bombay the area irrigable by a single *mot* does not exceed 3 acres on the average.

366. *Depth of subsoil water.*—There is no reliable information as to the depth of the subsoil water in different parts of the province, but in tracts where wells are in use the average depth appears to be under 30 feet; while over limited areas in the district of Nagpur and elsewhere, water is found at a depth of 10 or 12 feet. During the dry year of 1899-1900, the supply failed in many of the wells in the districts of Nimar, Betul, and Raipur; elsewhere the areas irrigated per well in that year appear to have been fairly normal.

367. *Extension of wells.*—The exact reasons why well-irrigation has been so little resorted to in the past are not easy to determine. But the most probable are the abundance of the rainfall in ordinary years; the former backward state of the country; the sparsity of the population; and, at least as regards the eastern districts, which in some respects resemble Bengal, the unsuitability of well cultivation for rice, which is their principal crop. There can be no doubt, however, that, at any rate in the western districts, there is some scope for the extension of well-irrigation. Up to the present time the people have been left very much to themselves it for irrigational purposes, the grants of *takari* for land improvements of all kinds were very small. We cannot affirm that, where loans were given out, much of the extension of well-irrigation in these Provinces is, we consider, of such importance that it should receive all the encouragement which can be afforded by liberal grants of *takari*, and, where good cause is shown, even by grants-in-aid or similar concessions. We agree with Mr. Craddock in thinking that if the matter be taken up energetically and prudently by the District Officers, on whose initiative the successful working of *takari* everywhere depends, there is a considerable field for the extension of land improvement loans; and that in the near future not less than four or five lakhs per annum might be distributed with advantage, instead of the meagre sum of Rs. 30,000, which is all that has been spent in ordinary years up to the present. It is essential, too, that the annual allotments should be continuous and assured for a number of years. If this policy, and the measures recommended in our general Chapters (V and VI) on private irrigation works and *takari*, are put into vigorous execution, only then, and not before, would we recognize that there must be difficulties connected with well cultivation which no liberality on the part of Government can overcome. In no circumstances, we fear, can irrigation from wells in the Central Provinces be so widely extended as to afford any efficient protection against famine. At the best, it will in all probability still be confined almost entirely to wheat, sugar-cane, and garden crops; and in some of the most suitable wheat tracts water is only found at an impracticable depth.

368. In the rice tracts especially, there seems to be but little hope of any considerable increase. Masonry wells for the irrigation of sugar-cane appear to be on the increase in Sambalpur; but in the rice districts generally, wells would as a rule only be required to supplement other forms of irrigation. But such supplemental wells are, so far as we have seen, confined almost entirely to tracts in which winter rice can be grown. In the rice tracts of Madras and Hyderabad wells under tanks are used extensively, but chiefly for the irrigation of the winter rice crop; though they are sometimes called upon to supplement the supply of the autumn crop when the rain or tank fails. In the Central Provinces wheat and other *rabi* crops take the place of the winter rice crop of more southern parts, and these but seldom require irrigation. Although supplemental wells would be invaluable in a dry year, we fear that the cultivator—certainly the cultivator of Chhattisgarh—is but little likely to go to the expense of providing a masonry well, and the appliances necessary for well-irrigation to which he would only have to resort in an occasional year. Even temporary wells, which it should often be possible to construct in a few days in

the vicinity of a tank, appear to have been dug in very small numbers to save the rice crop during the recent famine. But there are no doubt many tracts, where there is at present no well-irrigation, and in which masonry wells would be made if their advantages were better known; and even in Chhattisgarh it may be possible to do something towards developing the construction of supplemental wells under tanks where the subsoil does not admit of the construction of temporary wells. In all such tracts we think that Government might assist in introducing the use of wells, by giving very liberal grants-in-aid to the first cultivators who are willing to construct them, and even, in some special cases, by bearing the whole cost of construction.

369. For the increase of irrigation from temporary wells what is required is energetic encouragement in years of drought and short rainfall. In such years District Officers should have liberal grants placed at their disposal early in the *rabi* season; they should tour among the people and distribute the money on the spot to persons of respectability and sufficient resource to pay back the trifling sum advanced; and in order that there may be no delay, the tracts in which such advances are likely to be useful should be mapped out beforehand, and clear instructions issued regarding the measures to be adopted.

FIELD EMBANKMENTS.

370. *Cost, value, and area embanked.*—Field embankments are not usually classed as irrigation works, nor are the areas protected by them included in the annual returns of areas irrigated. But, practically, they are next to tanks the most important form of irrigation works in the Central Provinces; and they certainly afford substantial protection to one description of wheat lands, in a cheaper form than would seem to be possible by any of the recognized classes of irrigation works.

371. At a rough estimate there are about 600,000 acres of embanked fields in the province, of which about two-thirds are in the district of Jubbulpore, and the remainder chiefly in Narsinghpur and Damoh. Rice fields, which are generally surrounded by small ridges, a foot or a foot-and-a-half high, are not included in this area. The regular embankments, three feet or more in height, are confined almost entirely to the wheat lands; their chief function being to hold up water on the field, and thereby ensure a sufficient supply of moisture in the soil for the germination and sustenance of the *rabi* crop. But, in addition, the soil is fertilized by deposits of silt, and, provided the water is held up to a sufficient depth, *kans* grass and weeds are eradicated; while the thorough saturation of the fields reduces considerably the cost of cultivation, and often indeed even renders ploughing unnecessary. Occasionally, in the more level lands, a catch crop of rice is taken before the *rabi* crop is sown. Embanked fields are said to be more liable to suffer from rust than those which are not embanked; but there is a general consensus of opinion that over a series of years the gains from the system of embanking are greater than the loss. More than one of our witnesses has stated that, on an average, embanking doubles the outturn.

372. The protective value of these works was fully established during the recent famine, when the embanked tracts fared, on the whole, better than any others in the province. The wheat lands of the Jubbulpore *haveli*—a large tract which is almost completely embanked—yielded in 1896-97 a full crop, and even in 1899 a very fair outturn. Again, two large embankments made in 1897 by Seth Nathu Ram, a *malguzar* in the Saugor district, protected his village so effectively that he not only kept his tenants on the land, but paid all his revenue in the year 1900, when his neighbours both lost many of their tenants and failed to pay their assessment. In those districts which are specially addicted to the rapid spread of *kans*, embankments have a very special value if made either during or immediately after famine. There are indeed parts of the famine-stricken areas in which, without the aid of embankments, recovery from the effects of recent famines may be indefinitely postponed. For an immediate consequence of famine is the

enormous spread of *kans*; and the famine-stricken and decimated population, with their starving cattle, are quite unable to carry on the necessary campaign against the weed by means of thorough and persistent cultivation. The only resource for its extirpation is flooding through the agency of these embankments.

373. The height and cost of the embankment depend on the slope of the ground. In the more level lands of Jubbulpore and Narsinghpur, the usual height is from 3 to 5 feet, and the cost of embanking is estimated at Rs. 10 per acre submerged. In the uneven lands of Saugor and Damoh, where water is often held up to a depth of over 10 feet, an embankment is a more serious undertaking. Some of the larger embankments, like those to which we have just referred, submerge as much as 150 acres each, and practically form small tanks, from which, during the rainy season, the water is let out to irrigate rice or to saturate the fields below. But the banks are not provided with waste-weirs or with proper outlets, and in heavy rain they frequently burst and the water runs to waste. The cost of these embankments in uneven lands varies generally from about Rs. 20 to Rs. 30 per acre submerged, but for some of the larger works it reaches Rs. 50 or more.

374. *Scope for extension.*—It seems very doubtful if the more friable black soils, such as are found in portions of the Nerbudda Valley and elsewhere, are suitable for embanking, but it is worth while to make experiments in them. There are, however, still to be found in the districts of Saugor, Damoh, Narsinghpur, Hoshangabad, Nagpur, and parts of Wardha, and possibly also in Raipur and Bilaspur, large unembanked areas of the stiffer soils in which alone up to the present embankments have been made. The practice of embanking fields has received a considerable impetus during the recent years of drought; and we have no doubt that, if immediate advantage be taken of the present feeling in its favour, a great deal of valuable protection can be afforded to the province at a very small cost.

375. *Measures for encouragement.*—Generally the State's contribution might take the form of a grant-in-aid, equal to not more than half the total cost. The increased rental on embanked fields averages, we understand, about Re. 1-4-0 per acre. The share of this which the State would eventually receive would cover the interest charges on at least Rs. 16. But in many cases the landowner will be too poor to contribute even half the cost; and his estate may already be so heavily mortgaged that it would be unadvisable to grant him a loan for the purpose. In such cases, and especially where lands have been thrown out of cultivation by the growth of *kans*, we think that Government might bear the whole of the cost, if the constructors of the embankment would agree to pay a small annual charge on the acreage benefited, the charge to come into force three or four years after the completion of the work. Similarly in tracts where embankments are at present entirely unknown, but in which the conditions appear to be favourable for their construction, it will be necessary for Government to bear the whole cost of a few experimental works. But, in addition to encouraging the construction of now embankments, something should also be done towards restoring those which are breached and abandoned. In the Saugor district at least, these exist in considerable number, and many of them could be repaired at a moderate cost. Abandoned works of the kind are generally to be found in tracts where the advantages of embankments are already fully recognized, and, on principle, the people should be made to contribute something towards the cost of their repair.

376. *Arrangement for construction of new embankments.*—In the design and construction of new embankments in uneven lands, the assistance of the Public Works Department will, no doubt, be necessary; and, in view of the importance of such works as possible famine relief works, it is very desirable that the attention of the Department should be directed to them. But we think that, even in the case of the larger embankments, a considerable share of the work may safely be left to the people. At first, and until the Public Works officials have had more opportunity for gaining the necessary experience, it will be best,

in locating the works, to depend on the advice of the local experts who have gained some reputation in that way. A few smart and keen men of this kind might indeed be employed as temporary subordinates in the Department. When the general location of the work has been settled, the necessary levels should be taken, and the estimates prepared by the Public Works Department; but the actual execution of the work could generally be entrusted to the *malguzar*, to whom periodical payments would be made according to the quantities executed. Where the catchment area is large compared with the size of the bank, it will be necessary to provide proper waste-weirs and outlets, and as a general rule these should be constructed under professional supervision. The failure of existing embankments has been due, in almost all cases, to the absence of a waste-weir or to the want of a properly constructed outlet. We think that in the case of the large embankments which have already been made, Government might suitably recognize the enterprise displayed in their construction, by providing waste-weirs and outlets free of charge.

(v).—*Famine works and programmes.*

377. *Expenditure on works during the famines of 1896-97 and 1899-1900.*—The expenditure incurred during the recent famines on works of all kinds was as follows :—

| | 1896-97. | 1899-1900. |
|--|------------------|--------------------|
| | Rs. | Rs. |
| Railways | 17,144 | 9,62,000 |
| Roads | 80,53,541 | 1,12,84,000 |
| Constructing large irrigation tanks | ... | 5,28,000 |
| Constructing small ditto | ... | 6,45,000 |
| Repairing and improving old irrigation tanks | | 11,50,000 |
| Village tanks and water-supply | 5,29,148 | 14,07,000 |
| Miscellaneous | ... | 5,89,000 |
| TOTAL | 85,99,833 | 1,65,65,000 |

The amounts shown include only the expenditure incurred on wages, and about 9½ lakhs given in gratuitous relief to the dependents on works under the Public Works Department.

378. *Utility of the works.*—With the exception of some doubtful roads, on which 12½ lakhs were spent, the works which were carried out in 1899-1900 appear to have been generally useful. Compared with the figures for the previous famine, the most noticeable feature is the increase in expenditure on irrigation works. In 1896-97, the total expenditure incurred by the Public Works Department in connection with works of irrigation was under half a lakh; while under the direct agency of the Civil Department, only 101 small tanks were constructed or improved. In that famine the bulk of the work of tank improvement was carried out by private persons by means of special famine loans, which were granted free of interest, with, in most cases, a remission of one-fourth or one-fifth of the principal. By means of these loans, which were given out to the extent of over 11½ lakhs, a great deal of useful work was done in repairing tanks in the rice districts, and in constructing field embankments in the wheat tracts. But on the whole the expenditure on irrigation works was insignificant. In the recent famine every endeavour was made to substitute tank for road work. In the absence, however, of a detailed programme of irrigation works, road work, in spite of every effort, still remained the chief resource. Nevertheless, compared with the previous famine, a considerable advance was made in the expenditure on irrigation works. As already noted, over 5½ lakhs were spent on the construction, or partial construction, of 10 large tanks in the Chhattisgarh division; and over 18 lakhs, on the construction, improvement, or repair, of about 3,250 smaller tanks. These smaller works have already resulted in very considerable benefit to the areas commanded by them. None of the large tanks were finished before the close of the famine. We have already recommended that a few of the most promising should now be completed as experimental works.

379. *Famine programmes.*—The famine programmes for 1901, which were laid before us, provide relief for 874 million units against 100 millions actually relieved in 1899-1900. Out of this total number of units, irrigation projects provide for 355 millions; railways for 275 millions; roads for 235 millions; and village tanks, which remained over after the recent famine, for 9 millions. The detailed programme for each district is accompanied by a small plan showing clearly the position of each work. The programmes, which had been prepared in the Public Works Department, were, however, still incomplete as regards village works, the selection of which is left to the civil authorities, from whom lists were shortly expected. They are also incomplete as regards forest works, which in more than one district formed an important feature in the late relief operations. The inclusion of these classes of works, and of a complete scheme of irrigation works, will make the programmes very complete, and will provide employment on really useful works for larger numbers than are likely to require relief in any single famine. For the reasons specified in paragraph 372, we consider it of importance that field embankments should form a prominent feature of any famine programmes for the districts, such as Saugor, in which they are likely to be of value. Even the smaller embankments are likely to form a useful class of village work; while the larger, for which apparently there is considerable scope, are as good a form of employment as a tank *band*. It may be objected that embankments, although constructed by the State, will benefit the landholder in whose estate they are situated. But this consideration ought not to stand in the way. The chance of getting some increase of rent will probably induce the landholder to give up the land required for the work, free of charge; and, at the next settlement, Government will obtain some return for its outlay in the shape of increased revenue.

CHAPTER XVIII.—BENGAL.

380. *Description*.—The vast territory which is comprised in the Government of Bengal, with its 73 millions of inhabitants, presents very different conditions of agriculture. Chiefly consisting of a great plain raised little, if at all, above the sea in the east, it slopes gently towards the north-west to a level of about 200 ft. in a distance of 450 miles. In the north it skirts the foot of the Nepal Mountains, east of which it ascends 7,000 ft. to Darjiling. In the south the large province of Chota Nagpur and the *Hinterland* of Orissa contain much broken and hilly country, covered with forest and very thinly peopled. Through the heart of Bengal flows the Ganges, fed by the Gogra, the Gandak, and many minor rivers, till it mingles with the Brahmaputra from the north; and the two rivers together traverse and form the great Gangetic Delta. Throughout almost the whole country, rice is the food of the people, and the chief crop sown. It is liable to failure when there is a long break in the monsoon. Were it not for this, and for the density of the population, Bengal would require little or no famine protection. Where rice is grown throughout India it is usually benefited by regulated irrigation; but it may be said generally for Bengal, that east of the longitude of Calcutta there is no need whatever for artificial irrigation. In this part of Bengal the average rainfall is nowhere less than 54 inches, and it rises to 65 inches and 75 inches as one proceeds eastward, till at Chittagong it exceeds 100 inches. In Orissa the rainfall is about 60 inches, and until the disastrous year 1866 that province was considered immune from famine. The western portion of Bengal, forming the Commissionership of Patna and generally known as Bihar, bears a much closer resemblance to the districts of the United Provinces on the west, than to those of Bengal on the east. Here serious droughts have frequently occurred; especially in the districts bordering on Nepal in a zone of about 50 miles in width, extending from the Gandak to the Kosi, a distance of about 220 miles.

381. The irrigation fields of Bengal may be conveniently divided into five sections—

- | | |
|-------------------------------|-----------------------------------|
| (i) Orissa and Midnapur. | (iii) Bihar, south of the Ganges. |
| (ii) The Damodar river works. | (iv) Bihar, north of the Ganges. |
| (v) Chota Nagpur. | |

SECTION I.—THE CANALS OF ORISSA AND MIDNAPUR.

382. *The Orissa Canals*.—It lies beyond our terms of reference to enter on the history of these canals further than is necessary to point a moral for future guidance. The first proposal to employ the waters of Orissa and Midnapur for irrigation came from the fertile brain of the late General Sir Arthur Cotton, who was deputed to visit the province in 1858, with the object of giving advice as to controlling the flood waters of the Mahanadi. He recommended the construction of a complete system of irrigation and navigation canals, following the principles then being carried out in the deltas of the Godavari and Kistna. He estimated that an area of $2\frac{1}{4}$ millions of acres might thus be irrigated, and that navigation might be opened up between Orissa, Midnapur, and Calcutta, for the sum of £1,300,000. Here as elsewhere, Sir A. Cotton attached special importance to making the canals navigable; and considering how completely Orissa was cut off from the rest of India—without roads, rail roads, or harbours, and traversed by a succession of formidable and unbridged rivers,—and seeing the success that had attended the navigation works of the Godavari Delta, one cannot wonder at the importance Sir Arthur attached to making these canals navigable.

383. In 1860, the East India Irrigation and Canal Company was formed for the purpose of carrying out the works in Orissa, and water was first supplied for irrigation in 1865; but the works were not sufficiently advanced to be of any

real use in the terrible famine of 1866, beyond furnishing an excellent form of relief labour in the distressed districts. Before this it had become evident that the original estimate would be largely exceeded; and, as the Company found difficulty in raising further funds, the Government of India purchased the whole of the works for the sum of £1,089,550, and in 1869 the Company ceased to exist.

384. From the first, irrigation in Orissa made very slow progress. Those who had enthusiastically quoted the successes of the Madras deltas seem to have forgotten that in the deltas the rainfall does not exceed 40 inches; while, as already said, in Orissa it amounts to 60 inches per annum. The works, however, proceeded; and in 1873 it was decided to provide for an irrigable area of 1,140,000 acres in Orissa (exclusive of Midnapur), at an estimated cost of 440·88 lakhs of rupees. This area was to include 500,000 acres in the Balasore and Puri sections of the scheme, which had not then been put in hand and were soon after abandoned. The works completed up to date are said to command an area of 576,264 acres, the maximum discharge of the canals being 6,058 cusecs. The average area irrigated during the five years ending 1900-01 has been 195,973 acres, all practically contained in the Cuttack district. The maximum (in 1900-01) has been 203,540 acres. The total capital cost, exclusive of interest charges, has been Rs. 2,64,46,617. The average annual working expenses for the last five years are Rs. 4,91,830. The average gross revenue from all sources for the same period has been Rs. 4,67,913, so that the working expenses have not been fully covered. Of the revenue Rs. 2,77,756, or 59 per cent., has been on account of water rate, Rs. 1,63,240 or 35 per cent. on account of navigation dues, and the rest on account of minor receipts. The maximum water rate in any one year has been Rs. 2,87,812. The annual charges for interest now exceed 10½ lakhs.

385. *The Midnapur Canals*, drawn from the Kasai river, were at an early stage separated from those of Orissa and treated as a distinct project. The first estimate for these works, that of November 1869, amounted to Rs. 23,65,593, inclusive of all charges, for which sum it was calculated that 173,165 acres per annum would be commanded. The maximum discharge of the canal is 1,500 cusecs. These estimates have been repeatedly revised. The capital cost, exclusive of interest, now stands at Rs. 84,73,427, and the annual working expenses, on the average of the last five years, at Rs. 2,40,299. The average area annually irrigated for the same period has been 73,280 acres, and the maximum 91,217 acres (in 1892-93). The average gross revenue has been Rs. 2,50,530, of which Rs. 1,15,530 or 46 per cent. are on account of navigation dues.

386. *Irrigated areas*.—We do not propose to consider here, at any length, the reasons why these canals have fallen so short of the expectations which were general when the Company was constituted, although even at that time many warnings were given that the undertaking could not possibly be directly remunerative. There are, however, two points, regarding the Orissa Canals, on which some remarks may be offered—the smallness of the area for which water is taken, and the lowness of the rates which are charged for irrigation. As already stated, Sir Arthur Cotton originally estimated that 2½ millions of acres might be irrigated; but the average area is less than 200,000 acres. His estimate was doubtless a very rough one; and it probably included every acre of land within the Mahanadi Delta, and in the tract to be commanded by the Midnapur Canals, without reference to the question whether it was cultivable or would take water. The areas shown in the revised project of 1873 were estimated on the assumption, for which there was little warrant, that 500 acres in every square mile would be irrigated, so that the gross area commanded by the whole project was approximately 1,460,000 acres, or 820,000 acres excluding the Balasore and Puri sections. The area actually commanded by the present system of distributaries is estimated at 524,000 acres, of which only 264,000 acres, or about 320 acres per square mile commanded, are irrigable. The balance is either uncultivable or lies too low to take irrigation or too high to be irrigated otherwise than by lift; and lift irrigation is hardly practised at all. It is doubtful therefore whether the average area that can be irrigated by the present canals can ever exceed 250,000 acres. There is, we understand, no difficulty in regard to the

supply, which is generally sufficient for all the land that is ever likely to take irrigation.

387. *Water-rates.*—The question of the rates to be charged for water does not appear to have been considered at the time that the Company was formed; and the Directors were prepared to leave the matter to be settled while the works were in progress. After the works were taken over by Government in 1868, a scale of rates was notified which in practice proved to be prohibitive, *viz.*, Rs. 6 per acre for sugar-cane, Rs. 5 for certain other crops, and Rs. 3 for any single crop not remaining more than six months in the ground. In 1872 a system of annual block leases was introduced; the rate charged for every acre comprised in the block being Re. 1 or Re. 1-8, according as the lease was entered into before or after the 1st May. This system has been gradually modified to that which is now in force. The present practice is to give long term block leases, which often extend to 10 years, but to discriminate between the various classes of land forming a block. Thus lands lying so low that they never require irrigation, although water may often flow into them, are excluded from assessment; while a special rate of 8 annas per acre is charged on those lands which derive benefit from irrigation only in exceptionally dry years. The rate charged for other land, or the ruling rate, was until recently Re. 1-8 per acre, but it has been raised to Re. 1-12 in 1902-03. Higher rates are charged for single season leases, or for water taken between 1st April and 16th June; but the average or all round rate is about 3 annas less than the ruling rate, and it amounted to Re. 1-5 only during the three years ending 1901-02. The long lease system is well suited to these canals, as it tends to prevent loss of revenue in seasons in which irrigation is not required, and it appears to be popular with the cultivators. The fact nevertheless remains that after many years' nursing of the lease system, it has not been possible to induce the Uriya cultivator to pay an average rate of more than Re. 1-5 per acre for all the advantages of irrigation and protection from floods which the canals confer on him; and that, even after a revision of settlement, Government has not been able to propose a greater enhancement of this rate than 4 annas. On the Godavari and Kistna Canals in the Madras Presidency, the average rate varies from Rs. 4 to Rs. 4-12 per acre irrigated. The rates on the Midnapur Canals are at about the same pitch as those on the Orissa Canals; but there are no special rates for lands which derive material benefit from irrigation only in years of short rainfall; the all-round or average rate is therefore somewhat higher, and it amounted to Rs. 1-9-6 per acre during the three years ending 1901-02. There is little prospect of any early increase in these rates; although a gradual enhancement may be justified now that the country has been opened up by railways, and the backward Uriya been brought under influences which will encourage a higher class of cultivation. But even if it were possible to raise the average water rate to Rs. 2-8 per acre, to increase the irrigated area to 250,000 acres and to reduce the annual maintenance charges by 20 per cent., the return on the capital expended would be less than 1 per cent.

388. *Navigation.*—It is not probable that by the exercise of any economies in the construction of the canals of Orissa, they could ever have been made to pay to the State a profitable return on the capital spent on them. But we think it right here to call attention to one very large item of expenditure which, with the light of the experience of late years, we believe might have been greatly lessened, if not avoided altogether. We have said above that it was not unnatural that Sir Arthur Cotton should have attached much importance to the canals being made navigable. Thirty years ago this opinion was probably shared by all the most capable irrigation officers in India. Now, it may be said that excepting the deltas of the Godavari and the Kistna, there are no irrigation systems in the country in which canal navigation has yielded any financial return on the capital employed on it, or—a matter of more importance—in which it has really proved a boon to the people of the districts traversed. It might have been expected that if navigation could be a success anywhere, it would be in Orissa. But from the evidence we obtained on the spot, it is clear that, after 30 years of a very fine system of navigable canals, the people have not taken to navigation. “They send their

grain by carts" said one witness. "The chief means of transport in Orissa are pack bullocks" said another. "Even when they can get canal water to put boats on they very seldom use the boats. This is a province in which boats are very little used."* Since the opening of the railway through Orissa, the navigation receipts of these canals have diminished from Rs. 1,94,100 in 1897-98 to Rs. 78,153 in 1901-02, and there is no likelihood of navigation ever proving of much value. The navigation establishment costs about Rs. 16,000 per annum. The rate of tolls is about 2 pies per ton per mile.

389. *Value of the canals.*—A fair test of the value of irrigation to a district is to be found in the increase of the rent obtained for the land. On this subject we have fortunately very detailed information in the able report of Mr. S. L. Maddox, I.C.S., who surveyed and settled the province of Orissa between 1890 and 1900. Mr. Maddox states—

There is little, if any, evidence of general enhancement of rents on the ground of irrigation or of higher rates in irrigated than in unirrigated villages, though there is evidence that rent-rates have risen more in the protected and irrigated tracts than in the unprotected and unirrigated. There is, however, some reason to think that irrigation causes the lowest rents to rise and in fact has a tendency to equalize rents through an irrigated area * * * * It will be seen that the increase of cultivation is certainly no greater in the protected and irrigated group, and all the inquiries made have failed to elicit any evidence of a substantial extension of cultivation to lands which but for the canal water were not likely to have been reclaimed.* * * Amidst the mass of conflicting information on the subject of the increase of rent-rates one fact alone can be held to be abundantly proved, and that is that the cases in which a zamindar has openly enhanced rents on the ground of the accessibility of canal water or has imposed an irrigation cess of his own are very rare.

Elsewhere in India the rents of irrigated are sometimes two or three times those of unirrigated land. Here in Orissa, despite the increased crop and the assurance against drought, the tenant declines to pay a higher rent, and will only pay a very small water rate for the privilege of irrigation; nor has it been possible to increase this rate at settlement by more than four annas. It must be inferred then that the profit due to irrigation has been very small.

390. It must not, however, be assumed that these canals are of no value to Orissa. The value of the protection from floods afforded by the embankments is even greater than that of the protection from drought which is afforded by the canals. Were so terrible a calamity to befall Orissa again as that of 1865, the province would be in a far better position to withstand it. It is true that the irrigation is almost entirely confined to the Cuttack district. It hardly extends to Balasore in the north, and not at all to Puri in the south. But it is certain that the assured produce of 250,000 acres in the heart of the province, would largely influence the grain markets right and left. Cuttack is now connected by two navigable canals with False Point, one of the very few good anchorages on the whole coast of India. It is connected with Calcutta by another canal which touches also the seaport of Chandballi; while the railway places Calcutta within a few hours' reach of Balasore, Cuttack, and Puri.

SCOPE FOR FURTHER EXTENSION OF IRRIGATION.

391. *Coast districts.* --Considering these facts we are of opinion that there is no urgent need for further famine protection to the plains of Orissa; and indeed that there are few parts of India more secure, or in which the value of irrigation bears so small a proportion to its cost. We think that good might be effected by multiplying the number of irrigation sluices in the great flood embankments that line the rivers, in order that the land protected from destructive inundation may not be deprived of the beneficial inundation. Should it be considered necessary still further to protect Orissa, the volume of its rivers has not been exhausted, and irrigation might be carried into Puri and extended in Balasore for probably a not unreasonable sum. But we do not recommend these extensions in the face of the far more important projects on which capital may be better expended.

392. *Angul district.*—What has been said in the preceding paragraphs applies only to the alluvial plains of Orissa and Midnapur, forming the deltas of the Mahanadi, the Kasai, and other large rivers. But, inland of the Orissa deltas, is a very large tract of country, generally hilly or undulating, containing much forest with a scattered and backward aboriginal population. The greater part of this is included in the Government lands of Angul, which cover about 1,700 square miles, and are administered by a Deputy Commissioner. The people of this district are not so dependent on cereal harvests as those in the plains, the products of the forest going far to help them in times of drought. But when, as in 1899-1900, there is not only a failure of the rains, but also of the mango and *mahua* crop, the distress is severe. The average rainfall in Angul is 55 inches. Further south in the Khondal Hills it is as high as 67 inches. A certain amount of irrigation is effected in Angul by placing dams across streams and valleys and storing rain water. It is said that there are 503 private tanks, the largest of which waters about 100 acres and that 16,200 acres of cultivation depend on them. An annual grant of Rs. 4,000 is given for making and repairing the dams, which in the opinion of the Commissioner and Deputy Commissioner is a sum quite inadequate to the wants of the district. Angul is 64 miles from the nearest railway station, and in this distance two large unbridged rivers have to be crossed. The country is very badly supplied with roads, and they are considered of more importance than irrigation works. There is no District Engineer in Angul, and we think it might be an instruction to one of the Executive Engineers at Cuttack to visit it periodically, and to render assistance in designing and carrying out such roads and irrigation works as are required. They would probably be of a very cheap and simple nature. The annual revenue of Angul is Rs. 86,000. In the year 1889-90, Rs. 36,000 were spent on famine relief, and in the year 1899-1900, Rs. 21,000.

393. *Puri district.*—A considerable portion of the Puri district lies above the reach of any delta irrigation, and of this an area computed to exceed 56,000 acres is irrigated from tanks and *bands*. In this part of the district lies the Government Estate of Khurda, which has an occupied area of 254,000 acres. The irrigation works are said to be in need of repair, and, in our opinion, loans should be offered to the landowners to enable them to repair existing works and make improvements; while an example should be set upon the Government Estates, the requirements of which should be investigated under professional advice, and money should be allotted to execute such works as are likely to be beneficial.

SECTION II.—THE DAMODAR RIVER WORKS.

394. *Proposed storage works on the Damodar river.*—The Damodar river rises in the Ranchi District of Chota Nagpur, and flows through that province and through the districts of Burdwan, Hughli, and Howrah, joining the river Hughli some distance below Calcutta. The rainfall of its catchment basin varies from 55 to 65 inches per annum. The flood discharge of the river is as high as 470,000 cusecs flowing for 3 days. In March it diminishes to less than 100 cusecs. The first proposal for dealing with the waters of the Damodar river was made in 1866, and its object was not irrigation, but the construction of a Navigation Canal to connect Calcutta with the coal fields of Raniganj. This led to the idea of irrigating from the canal, and thence to that of storing and controlling the enormous floods which occasionally cause very great damage. The Navigation Canal from Raniganj to Calcutta, and the storage reservoirs on the Upper Damodar, have never yet been made, and since the development of railways it is unlikely that the former ever will be made. The control of the flood waters of the Damodar by storage reservoirs may well be worthy of consideration, but it is beyond the scope of our inquiry.

395. It may be observed, however, that the irrigating capacity of reservoirs constructed mainly for the purpose of counteracting floods must always be very small in comparison with the storage provided. The capacity required for effectively controlling the floods of the Damodar has been variously estimated as from 50,000

to 100,000 million cubic feet, but the lower amount is probably the most that would ever be seriously contemplated. It is an almost necessary condition of such a reservoir that as much as possible of the stored water should be run off as soon as a great flood has passed, so as to leave room for the interception of as much as possible of the succeeding flood. Allowing for this, and for the amount that would have to be reserved for maintaining both on the proposed canal and on the Damodar itself, the volume available for irrigation would be small and uncertain when compared with the capacity of the reservoirs. These would be situated in the rocky, hilly country of Chota Nagpur, and it cannot be inferred that a reservoir was constructed; for the sites would be selected every valley in which a reservoir was constructed; for the sites would be selected more with reference to the facilities which they offered for impounding flood waters, than with a view to the probable demand for irrigation. Lastly, the value of irrigation in this part of Bengal, as measured by the amount which the people are willing to pay for it, is so small that the irrigation revenue derivable from the costly works proposed would not by itself go very far to justify their construction. If now, or at any future time, the construction of these reservoirs should be proposed as part of a scheme for extending or improving water communications in Bengal, and for moderating the floods of the Damodar, account would no doubt be taken of any irrigation that can be effected from them, and of the revenue thereon that may be anticipated; but this must be regarded as a subsidiary matter. We are unable, on the whole, to recommend the construction of these works on the ground of their value as a protection against famine.

396. *The Eden Canal.*—The employment of the Damodar waters for irrigation has come about in quite an indirect way. The districts of Burdwan and Hughli had been suffering for some years from a very severe epidemic of fever, attributed to the stagnant and insanitary condition of old river-beds and minor drainage lines. It was believed that this state of affairs might be improved if a supply of fresh water for drinking and other purposes could be thrown in from the Damodar; and this ultimately led to the construction of sluices on the left bank of the river at Jujoti, 8 miles above Burdwan, by which water was admitted into a *nala*, whence by further sluices and a weir it was passed on into the Eden Canal—a work opened by the late Sir Ashley Eden in 1881. Twenty miles further on the water is discharged into two natural drainage streams. It must be remembered then that the Eden Canal was not intended for irrigation but for sanitary purposes. Nevertheless during the last 10 years it has been largely used for irrigation.

397. The cost of the Eden Canal up to date has been Rs. 7,82,161. The average annual charges for maintenance, establishment, etc., in the last five years have been Rs. 57,453. The area irrigated per annum is on an average 25,975 acres. It was as high as 71,333 acres in 1892-93, and the year following as low as 11,739 acres. The average gross revenue from water rates amounts to Rs. 30,656. We were assured in evidence that there was a great demand for irrigation on the Eden Canal, but we had no evidence that the irrigators would be willing to pay more for their water than they now do, that is, about a rupee per acre.

EXTENSION OF WORKS.

398. *Proposed weir across the Damodar.*—There is no weir across the Damodar at the head of the Eden Canal. This is evidently a great want, for without a weir there can never be any certainty of securing the supply required for the canal. Mr. Maconelly notes that in 1902 while there was a volume of 4,000 cusecs passing down the river, the supply entering the canal was only 80 cusecs, about one-tenth of what it should have been. The cost of a weir at Jujoti would not be less than 8 lakhs of rupees. Mr. Horn, the Chief Engineer, is of opinion that it would be better to make the Damodar weir at Raniganj (a much cheaper site than Jujoti) and to take the head of the Eden Canal up to this point, a distance of about 16 miles. He adds—“There is much more likelihood of water being in demand for irrigation between Raniganj and Burdwan as the country is much drier, and the land

would derive much more benefit from the fertilizing Damodar silt than lower down." We are of opinion that the irrigation system of the Eden Canal can never be satisfactory until there is a weir across the river at its head sluices. But this canal is not required for protection against famine, and until the irrigators are ready to pay for the water a rate sufficient to ensure a fair return on the capital cost, we cannot recommend Government to incur this outlay.

SECTION III.—BIHAR, SOUTH OF THE GANGES.

399. *General conditions.*—The province of Bihar, forming the Patna Division, is under very different climatic conditions from those prevailing in the catchment basins of the Mahanadi, Kasai, or Damodar. Here the rainfall varies from 43 to 50 inches, only exceeding this amount in the narrow zone under the Himalayas. South of the Ganges it does not exceed 45 inches. The three districts now to be considered are Shahabad, Patna, and Gaya. They have an area of 11,160 square miles and a population of 5,647,614; and in these three districts lies the most important irrigation system of Bengal, that of the Sone Canals. Judging from the extent of relief operations in 1873-74 and in 1896-97, famine has never been severe in modern times throughout this tract. No persons were employed on relief works in Patna in 1873-74, nor in Gaya in 1896-97, and in the latter year only 12,000 people were employed in the rest of the tract.

400. *The Sone Canals.*—The idea of using the waters of the river Sone for irrigation originated about 50 years ago with the late Colonel C. H. Dickens, R.A., and for many years the subject was under discussion. The project was undertaken by the East India Irrigation and Canal Company, but was handed back to Government in 1863, and work was not actually commenced until the following year. Sufficient progress had been made to allow of water being supplied through breaches in the banks of the Arrah Canal to the parched fields in the drought of 1873, and the canals were completed a few years after. They carry a maximum volume of 6,350 cusecs. About 80 per cent. of the irrigation lies in the Shahabad district, 11 per cent. in Gaya, and 9 per cent. in Patna. Here, as in the case of the Orissa Canals, the early forecasts of outlay and revenue soon proved fallacious. By curtailing the scope of the project Colonel Dickens' estimate of cost of 1861 has not been exceeded. But, whereas in October 1875 the Government of India anticipated a yearly irrigated area of 1,043,630 acres, the average of the five years ending 1900-01 was only 463,181 acres, and the maximum ever attained was 555,156 acres, in 1896-97. The cultivated area commanded by the canals is 1,354,302 acres; so that about one-third of this is watered every year.

401. The total capital cost of the Sone Canals up to 31st March 1902 has been Rs. 2,67,62,426. The annual charges for maintenance, revenue management, etc., amount to Rs. 6,04,804, taken on the average of the three years ending 31st March 1902. The total annual revenue calculated for the same period is Rs. 11,12,278, leaving a net revenue of Rs. 5,07,474 equivalent to an interest of 1.89 per cent. on the capital outlay. Here, as in Orissa, a very large sum was sacrificed to making the canals first class navigation lines. The Chief Engineer estimates this sum at one-quarter the whole capital outlay or Rs. 66,85,606. The Buxar and the Patna Canals radiate from one point (Dehri), and reach the Ganges about 80 miles apart. The Arrah Canal starting from the same point flows between the two. It is difficult to see how navigation on this intermediate line, requiring a lockage of 160 feet, could ever have been expected to pay. The navigation receipts have been seriously affected by the opening of the Moghul Serai-Gya Railway. During the four years ending 1899-1900 they averaged Rs. 87,600; but they fell to Rs. 36,507 in 1900-01, and to Rs. 23,595 in the following year. The average cost of navigation establishment only is Rs. 15,000 per annum. There are 218 miles open to navigation; and the average rate of tollage is about 2.2 pies per ton mile.

402. Before the completion of the canals, it was anticipated that the chief demand for water would be for the *rabi* or cold weather irrigation, as had been

found to be the case on the irrigation works of the Punjab and United Provinces. But it was soon found to be otherwise; and now nearly 70 per cent. of the whole irrigation is for the *kharif* or autumn crop which practically consists of rice, the average area of which in the last five years has been 334,565 acres, while that of the *rabi* crop has been only 128,616 acres. It is, at first sight, astonishing that the *kharif* irrigation is not more extensive, for only once since the canals have been opened, has the water in the river not been sufficient to supply the full discharge of 6,000 cusecs, enough to irrigate 516,000 acres of rice. But this is easily explained.

403. *The hathia*.—The universal practice in this part of Bengal is to run the water off the rice fields (*nigar*) in September; and after this the crop must get at least one watering during a period of 14 days, called the *hathia*,—generally from the 26th September to the 10th of October. If there is a good rainfall during this period the rice will mature unaided by irrigation. Otherwise it must receive water. The capacity of the canals is thus measured by the maximum area which they can irrigate during these 14 days. It is of no avail irrigating to their full capacity, say 516,000 acres, during July and August if they cannot water that area in 14 days in October. Should there be a good rainfall during this period, the 516,000 acres may mature. But if the *hathia* is a dry one, some of the crop will fail to obtain water and must perish.

404. *Former system of irrigation*.—Previous to the opening of the Sone Canals, the country was watered by a system still largely prevailing beyond the area of canal irrigation and in the neighbouring districts. The soil is that of the old alluvial system, and the surface of the country is slightly undulating; a condition which lends itself to the formation of bands across the depressions, intercepting the rainfall and forming a series of reservoirs, locally known as *aharas*. These are sometimes further supplied by ditches or canals, termed *pains*, leading water from the nearest drainage stream. When the Sone Canals were first opened, water was allowed to fill up the *aharas*, and to be drawn thence on to the fields. But when it came to claiming water rates, the rayats maintained that they had only used rain and not canal water, and it was impossible for the irrigation officer to disprove it. It became necessary then steadily to discountenance the filling of *aharas*.

405. *Leases for water*.—It was generally calculated that water would be given for 50 per cent. of the whole area of a village; and this irrigated portion was marked off into one or more well-defined blocks, for the irrigation of which a charge was made at a reduced rate per acre. The cultivator is supplied with water enough for his block, but he may not use it for irrigation beyond its limits. Conditions are laid down in each case, and among others it is now required that there shall be a well-defined village channel, and that the water shall not be allowed to escape into an *ahara*. These contracts have become very popular and are eagerly renewed, so that now 75 per cent. of the irrigated area receives water on long lease.

406. *Water-rates*.—The present charges per acre irrigated for water on the Sone Canals are as follows:—

| | Rs. | A. |
|---|-----|----|
| Seven years' leases for block areas, all crops between the 25th June and the 25th of the next March | 2 | 8 |
| <i>Kharif</i> season leases between 25th June and 25th October | 3 | 8 |
| <i>Rabi</i> season leases between 15th October and 25th March | 2 | 0 |
| Hot weather leases between 25th March and 25th June | 4 | 8 |
| Ditto ditto | 2 | 0 |

The last two rates were each increased by 8 annas in 1902. In ordinary circumstances we can well understand the policy of preventing canal water from escaping into *aharas*. It is a more wasteful system than carrying it direct to the field, and may easily lead to disputes as to rates. But we think

it might be possible to utilize the *aharas* during the month of September, when there is abundance of water in the river, so that they may assist in meeting the great demand in the *hathia*. It seems to us that when water is plentiful it would be wiser to encourage than to prohibit the filling of as many of these reservoirs as exist within the blocks; and that no extra charge should be made, as the effect will be to reduce the intensity of the demand when the critical time comes. As regards *aharas* outside the blocks, we observe that there is a sanctioned rate for water supplied by volume between 1st November and 15th March, *viz.*, one anna for every sixteenth of a cusec running for 12 hours, which is equivalent to a charge of Re. 1 per 43,200 cubic feet, approximately the volume necessary to flood an acre one foot deep. The rate from 1st September to 31st October is four times as high. It is said that water is never taken for *aharas* under this rule. The system of charging is rather complicated; but it seems possible that it might be popularized if owners of *aharas* were allowed to apply to have them filled between certain dates, on payment of a fixed charge for each, according to size. The applications might be for one year, or for a suitable number of years, or until further notice; and the canal establishment would arrange to fill the *aharas* before the latest date fixed. We found that a similar system was in force on some of the Punjab canals for filling village tanks for watering cattle, etc., during the period of slack demand in April and May. In this case no charge is made, but there is a regular system of registering the tanks and arranging for their being filled systematically when water can be spared. We cannot say how far the irrigated area can be extended by utilizing *aharas* as storage works before the *hathia* sets in; but we think that the practice should lead to a considerable increase in the irrigated area and in the canal revenue. It is right to add that neither Mr. Horn, the Chief Engineer, nor his predecessor, Mr. Buckley, is in favour of this proposal. Apart from this, there are only two ways, by which the *kharif* irrigation on these canals could be increased: 1st, by constructing storage works in the Upper Sone and increasing the discharging capacity of the canals when necessary; and, 2nd, by enforcing an extension of the *hathia* period from 14 to 21 days by restricting the supplies to the blocks, so far as this can be done without injury to the crops. We have no information to show what the cost of the former plan would be, as the question does not appear to have ever been seriously considered; but we do not regard it as in any way urgent, at any rate so long as water rates on these canals remain as low as they are at present.

407. Mr. Horn thinks that the water-rates on the Sone Canals might be raised, and Mr. Hare, the Commissioner of Patna, would approve of the measure, provided it were carried out "very gradually up to the real value of the water." There appear to be strong reasons for believing that this limit has not yet been approached. The area commanded by these canals is under permanent settlement; and in the present state of the law the only means by which Government can obtain any share in the agricultural profits due to irrigation, is by means of an occupier's rate, or charge for water supplied. From the first, special precautions have been taken to avoid the slightest resemblance of compulsion in respect of this rate. A cultivator is as free to take water at the prescribed rates, or to refuse it, as he is to purchase or refrain from purchasing manure. Elsewhere in India the fact that a field has been irrigated is in itself sufficient to justify the charge of a water rate; but there is a special rule under the Bengal Irrigation Act which declares that no charge can be made for irrigation unless a formal application has been received for water. A penal charge may be imposed in case of illicit or concealed irrigation; but no charge can be made for what is known as involuntary irrigation. Owing to the fact that irrigation is not indispensable in years of ordinary rainfall, and to the original backwardness of the cultivators in resorting to it, the rates fixed have been very low, and the present system of long leases has been developed; the holders of these leases having preferential claims to water during periods of high demand, such as occur in very dry seasons. These measures were wise and judicious; but it appears to be no longer necessary to charge very low rates in order to educate the cultivators as to the value of irrigation. The area under long leases has been steadily expanding. During the three years ending in March 1896 it

averaged 271,552 acres; but in 1901-02 it amounted to 317,318 acres, although the rate was increased from Rs. 2 to Rs 2-8 from the 1st April 1897. The increase of revenue has been gradual but continuous. It is now approaching its limit, as these leases are only given for the areas for which protection can be assured even in the driest years. The demands for such leases cannot in fact be fully met. During the three years ending 1901-02, applications were made for long leases for 252,393 acres; but the area for which applications were refused amounted to 112,648 acres, or to 44 per cent. of the area applied for. The Executive Engineer, Arrah Division, has reported that in that Division the canals are now practically leased up to their limit, and that any new lease can only be taken if it is very favourably situated. The demand for season leases is equally well maintained, and is equally near to the limit of the irrigating capacity of the works. In short, the demand on these canals is in a thoroughly healthy condition; and it cannot be said that the failure of the project as a financial investment is now in any way due, as in Orissa, to a slack demand, or to the inability of the cultivators to appreciate the value of irrigation. In such circumstances it is difficult to justify the low rates which are now charged.

408. *Recommendation to increase water-rates.*—The question may be considered from another point of view. Experiments on the outturn of irrigated and unirrigated crops of rice and wheat have been made for many years in all the divisions of these canals. The general results of these experiments, after valuing the outturn at the average rates received by the cultivators, are as shown below:—

| Three years ending | AVERAGE VALUE OF ANNUAL OUTTURN (GRAIN AND STRAW) PER ACRE. | | | | | |
|--------------------|---|--------------|-------------|------------|--------------|-------------|
| | RICE. | | | WHEAT. | | |
| | Irrigated. | Unirrigated. | Difference. | Irrigated. | Unirrigated. | Difference. |
| | Rs. | Rs. | Rs. | Rs. | Rs. | Rs. |
| March 1896 . . . | 33 | not observed | | 36 | not observed | |
| „ 1899 . . . | 38 | 24 | 14 | 43 | 38 | 5 |
| „ 1902 . . . | 34 | 23 | 11 | 42 | 32 | 10 |

The results in the last line are based on 989 separate experiments, of which 409 were on irrigated, and 268 on unirrigated rice. Of the wheat experiments 170 were on irrigated, and 142 on unirrigated lands. Details of experiments of this kind are of course always open to criticism, but there is no reason to suppose that the differences in favour of irrigation are on the side of excess; and, if it is true that irrigation increases the value of an acre of rice by Rs. 12, and that of an acre of wheat by Rs. 7, there is room for a considerable enhancement of the water rates which are now charged.

an enhancement of the land-revenue their proper share of return for irrigation supplied to their lands. But the case of permanently settled tracts, like the Sone area, is altogether different. The land-revenue is immutable; and, the irrigation revenue being derived solely from water rates falling wholly on the occupier, the landowner pays nothing to the State for any benefit which he may have received from works which have been constructed at great expense by Government. Now, we find incontestable evidence that the landowner frequently, if not always, receives immense benefit from the irrigation provided on the Sone system. Mr. Oldham cites a case in which an owner admitted that a village, which at one time brought him in only Rs. 3,000, since the introduction of canal irrigation returns him Rs. 18,000 per annum. He knew of lands of which the rents had risen from Rs. 3 to Rs. 5 and Rs. 7 per *bigha*, from the same cause. A Patna landowner admitted that the income of an estate, of which he was a shareholder, had risen from Rs. 8,000 to Rs. 23,000 in a good year. The Executive Engineer, Buxar Division, knew of cases in which rents had risen from 4 annas to as many rupees; and the Superintending Engineer instanced cases in which the rents had been quadrupled. Of course, in the case of non-occupancy tenants, the landowner has no difficulty in getting the enhancement; but our witnesses were of opinion that in spite of the provisions of the Tenancy Act, he contrived generally to levy enhancement from the occupancy tenant as well. Enhancements, by contract with the landowner, are admissible in the case of such tenants; and the position of the landowner in valuable irrigated land is so strong that he can, no doubt with ease, obtain the consent of his tenant to any reasonable enhancement. Of course, where the custom prevails of paying rent in kind, the landowner obtains automatically, with the increase in the produce due to irrigation, an increase in the quantity which falls to his share. Unless the evidence is altogether incorrect and misleading, the landowners of the Sone area are enjoying immense advantages, for which they are paying the State little or nothing; and we think that in justice to the general tax-payer, a serious endeavour ought to be made to get something substantial from them. If it be alleged that to levy an owners' rate would be an infringement of the permanent settlement of land-revenue, the reply seems to be that there is no ground for considering the owners' rate, any more than the occupiers' rate, to be land-revenue. Both are payments for water supplied by the State. There is another difficulty which has been brought to our notice, namely, that any rate or charge imposed on the owner is certain to be passed on by him to his tenant. This objection ought to be met so far as possible by strengthening the law for the protection of the tenant. But if, notwithstanding all endeavours to strengthen it, the law still remains wholly or partially ineffective for such protection, we think that the principle should be recognized that an owners' rate is legally and equitably leviable from the landowner; and that, unless serious administrative inconvenience would result, the rate should be actually imposed, and levied from him, whether he succeeds in passing on the charge or any portion of it to the tenant, or not.

410. There appears to us to be a very strong case for taking a larger irrigation revenue from the Sone Canals, either from the owner or the occupier, or from both. The interest charges on the Sone Canals to the end of 1901-02 have exceeded the net revenue by Rs. 2,15,44,697. During the three years ending March 1902, the average annual excess of interest charges over net revenue amounted to Rs. 5,26,024; so that, until measures are taken for increasing the net revenue, these works are likely to impose a constant annual charge of about 5 lakhs on the State. The average annual amount of the water rates during the same period has been Rs. 10,26,459, on an area of 481,333 acres, or an average of Rs. 2.15 per acre. If this average rate could be increased by 50 per cent. or to Rs. 3-4-0 per acre, or if an owners' rate of about Re. 1-1-0 per acre could be imposed, the charges for interest would be fully covered in future. It may not be possible to make such an increase all at once. But we think that the question of making some progressive advance on the present rates deserves early consideration; and that an even higher average rate than Rs. 3-4 may be eventually contemplated and will be paid without difficulty. The canals have done a great deal for this tract. They have afforded it absolute protection against famine; and they have greatly increased the profits

of cultivation, and the material resources of the community. Although the work has been so far unproductive, we think that its construction has been fully justified by its great protective value. Were it possible to find two unirrigated districts in precisely similar conditions as Orissa and Southern Bihar, we should hesitate before recommending such an outlay as has been incurred in the former for the purpose of protecting it from famine; but we should have no hesitation in respect of the latter. This is no reason, however, why this work should continue to impose a permanent charge on the tax-payer, if the people who derive such great benefits from it are now in a position to pay the full cost of providing them.

411. *Advantage of the lease system.*—One valuable lesson is to be learned from the history of the Sone Canal system, namely, that even in areas in which the rainfall is considerable and the existing means of irrigation tolerably well developed, and where therefore the likelihood of a keen demand for water in ordinary years is a matter of uncertainty, there is good ground for believing that ultimately, though not perhaps for many years, the people may learn to set a high value on the water, and take up at remunerative rates all that can be supplied to them. In such cases the system of leases is excellent, teaching the people the value of water as an insurance, and protecting the revenue from excessive fluctuation.

412. *Irrigation in Bhabua and Sasseram.*—The whole area of the Shahabad district is 4,368 square miles, of which much the larger portion is sufficiently protected by the Sone Canals. There remains to the west an important Sub-division (Bhabua) and a part of Sasseram, containing about 600 square miles in the plains, besides some hill country, beyond the reach of the Sone waters. This tract, although 281,000 acres are said to be irrigated from private works, is still much exposed to drought; and the barrenness of the fields is all the more striking from its contrast to the fertile plains in the neighbourhood. This Sub-division is traversed by several minor streams coming from the Kaimur Hills in the south, and the subject of drawing on them for water has been fully discussed. Six years ago, Mr. Buckley, then Superintending Engineer, wrote an important note on the subject and concluded that the supply in these rivers was so precarious that he could not recommend the outlay of Government money on the project. The principal river here is the Karamnassa, which separates Shahabad from the Mirzapur district of the United Provinces. The supply of this river is not reliable; but the need of irrigation is so great that, in October 1902, we thought it worth while to urge on the Bengal Government the importance of surveying the upper portion of its course where it passes through hills. Here, the late Mr. Levinge, formerly Chief Engineer of Irrigation Works in Bengal, left it on record that in "his confident opinion" there was a magnificent site for a reservoir to contain 40,500 million cubic feet of water. The survey is now in progress, and it seems clear that an effective reservoir can be made. But whether it will be at a reasonable cost we cannot yet say; and we cannot admit that the liability of this Sub-division to famine is so great as to justify a large unremunerative outlay. If the Bengal Government sees fit to proceed with this project, it will of course be necessary to consult with the authorities of the United Provinces, who have an equally strong claim to the use of the Karamnassa for the dry plains of Mirzapur.

413. *Private irrigation works in Eastern Bihar.*—East of the Sone Canals in the Patna, Gaya, and Monghyr districts, there are no State irrigation works, but a great deal of very important irrigation is effected by private means. The system adopted is that of *pains* and *aharas* described in paragraph 403. This system seems to have attained its highest development in Gaya, where 1,670,000 acres—more than half the area of the district—are said to be watered in this way. In the upper lands, where *pains* are not practicable, *aharas* only are made. In lower lands there are both *pains* and *aharas*, working in conjunction or separately. The former are sometimes really canals, more than one of which irrigates many thousands of acres in from 100 to 200 villages. Sometimes these works are supplied with masonry sluices, but this is exceptional.

414. These works are essentially private—the property of the landowners. The custom in these districts, except where there is canal irrigation, is for the tenant to pay his rent in kind sharing the produce of the soil with his landowner. Theoretically the landowner and the tenant should share the produce equally, but generally the former claims at least $\frac{2}{3}$ ths of the whole. Where this system prevails, the customary obligation to repair *pains* and *aharas* rests on the landowners; and the maintenance of the *pains* depends wholly on the proper observance of this obligation. Unless therefore the system of payment in kind (*baoli*) is also maintained, the obligation, and such inducement as the landowner now has to observe it, will disappear together. Mr. Oldham, Collector of Gaya, who has devoted much attention to the question of how the maintenance of these private irrigation works, which he regards as essential to the protection and prosperity of the country, should be secured, would prefer to see the *baoli* system everywhere abolished in favour of the cash system of rents. In this opinion, however, he is not supported by other officers; and as regards the maintenance of these works, it is not apparent what advantage would be gained by the change, which would result in the transfer of the obligation from the shoulders of the landowner to those of the tenant. It is true, however, that, owing to the sub-division of land, the landowner now rarely does his duty in keeping the *pain* silt-cleared and the *ahara* in repair; but he would do it still less were it not that he shares in the produce of the land. Owing to the sub-division of the land in recent years, and to the total want of any power of combination on the part of the landowners, these simple but valuable irrigation works are falling year by year into disrepair. There is no law to compel a person to carry out repairs, so they are not done; and, unless some means can be found to stop the resulting deterioration, it would appear as if the Government would have to step in and take over the works, or at least the *pains*, altogether. There is, however, no urgency at present for so sweeping a measure.

415. *Need of legislation.*—Mr. Oldham, the Collector, with the full concurrence of Mr. Hare, the Commissioner, recommends that an Act be passed, enabling the Collector to compel the landowners to carry out repairs, when he is satisfied on competent advice that they are absolutely required to keep up the irrigation. In the event of the landowner refusing to bear his share of the work, Mr. Oldham recommends that the Collector should have power to execute it and charge the cost to him.

416. In connection with these private irrigation works, another matter is said to require legislation. The water is diverted from a river into the *pain* by means of temporary dams; and if one of the owners of the *pain* is energetic and wishes to take in more water than his share, he can easily enlarge the channel at the head, which is not provided with a masonry sluice, or he can increase the height of the dam across the river. In the same way a landowner may put a *band* in the *pain* below his own fields in order to increase his supply. Or, if he is a new-comer, he may make a new *pain* and carry water off the river, to the detriment of the owners further downstream. It is easily to be seen what a fertile source of dispute this might be, there being no record-of-rights in the water. As a matter of fact, it leads to much litigation, as well as to rioting and local disturbances.

417. Mr. Hare recommends legislation to the following effect:—

To give the Collector power to interfere in cases of the construction of *bands* in rivers, in order —

- (1) to prevent disputes and rioting;
- (2) to prevent unreasonable waste of water to the detriment of those who live lower down the river;
- (3) to prevent grave and material alterations in, and diversions of, the rivers, which may seriously affect the country.

Mr. Hare does not consider it would be judicious to allow the Collector to make a full record-of-rights in water, such as is prepared for land. He apprehends that the record would be too complicated. But he considers that

a record should be prepared which would show the facts ; and that, when disputes arise, the Collector should have power, on application of the parties, to give an *ad interim* order which should remain in force until set aside by a decree of the Civil Courts. On the other hand, Mr. Oldham, and other officers of considerable authority, such as the Hon'ble Mr. Bourdillon, Mr. Macpherson, Mr. Finucane, Mr. Maddox, and our local member Mr. Allen, consider that it would be decidedly advantageous to have prepared a record-of-rights in water, no less full than the record-of-rights in land. There is said to be no legal obstacle to the preparation of such a record ; and the chief reason why it has not been done seems to be, that the work of preparing the record for land alone has been as much as the existing staff and establishments entertained for the purpose could cope with. The landowners, no less than the officials whom we questioned on the subject, agreed that, if the power of deciding disputes, with reference to the exercise of or encroachment on rights in water, were exercised by the Collector instead of by the Civil Courts, nothing but good would result. We think, then, that at least in all districts, or parts of districts, in which the maintenance of private works of irrigation is neglected owing to the non-observance of customary obligations, or where disputes frequently arise owing to the misuse or misappropriation of water, full records-of-rights in water should be prepared with the least practicable delay ; and that the Collector should be given, for the enforcement of the rights so recorded, not less authority than he has for the enforcement of rights in land. We consider also that power should be given to the Collector to compel the owners of a *pain* to build a proper masonry sluice at its head, wherever there was reason to believe that more water was entering the *pain* than was its just share ; and, in the same way, that the Collector should have power to force any landowner to build a masonry outlet in the banks of the *pain* for his irrigation channel, when he was evidently taking more than his just share of the water. Another point brought to our notice is the difficulty experienced by any one in taking a water channel through the land of another owner who may object to give a right of way. We think that some power of compulsorily acquiring a right of occupation, similar to the provisions relating to the construction of water-courses in the Northern Indian Canal and Drainage Act VIII of 1873, should be conferred upon the proper authority.

SECTION IV.—BIHAR, NORTH OF THE GANGES.

418. *Irrigation in Northern Bihar.*—The four districts of the Patna Division north of the Ganges are Champaran, Saran, Muzaffarpur, and Darbhanga. They consist of 12,168 square miles and have a population of 9,867,373, or 800 to the square mile. This tract is, as we have already observed, liable to frequent and serious drought. Between the years 1873-74 and 1899-1900, it suffered from two famines, and from two scarcities sufficiently severe to require an appreciable expenditure on relief operations. In 1896-97 the famine expenditure amounted to 85 lakhs. The scarcity of 1888-89 cost $4\frac{3}{4}$ lakhs ; and that of 1891-92, nearly $2\frac{3}{4}$. The severity with which the effects of drought are felt is attributable largely no doubt to the density of the population, a considerable proportion of which subsist from hand to mouth, and suffer accordingly whenever the crops fail seriously and prices rise high. The occurrence of three droughts within the last fourteen years demonstrates the variability of the seasons in a most striking manner, and suggests the inference that irrigation works are likely to be of considerable value as a means of protection. In this tract the only State irrigation work actually in operation is the small Madhuban Canal, in the Champaran district, drawn from the Teur river over which a weir is built. It is $6\frac{3}{4}$ miles long, and, on an average, irrigates annually 4,126 acres. It has cost up to date Rs. 78,546, of which Government has paid only Rs. 6,881, the balance having been subscribed by the landowners who benefit by it. The annual cost of maintenance is Rs. 7,495, but the Collector reports that the arrangements for irrigation are very unsatisfactory. Water is given free of charge to the *raya*. This small work requires no further notice.

419. *The Tribeni Canal.*—Although the rainfall of Tirlhut, north of the Gandak, is rather heavier than that in the lands further south, it is in the former that the effects of drought have been most severely felt; owing, we were told, to the fact that rice is more exclusively cultivated in the northern part, while further south other produce is raised requiring less water. Attention then has been chiefly turned to the irrigation of Northern Tirlhut. We take first the district of Champaran, which is divided into two distinct parts by the river Sikrana, flowing from the north-west corner in a south-easterly direction. To the north of this river the slope of the country is from north to south, and the soil is clayey and well adapted to rice cultivation. A considerable proportion of the northern part is already irrigated. To the south of the Sikrana the general slope of the country is parallel to that of the river. The soil consists of fine light sand and clay, and is often impregnated with saline matter. The cultivators in this tract object to irrigate their land, on the ground that once irrigated it always requires irrigation. They seldom even irrigate from wells, although in the dry season the water surface is only 12 feet below the surface. This seems to indicate that this tract does not often suffer from drought. On its north-western border the district of Champaran is bounded for some miles by the Gandak, one of the few great rivers of Bihar which, like the Ganges and Gogra, are fed from the snows, and the volume of which is therefore absolutely reliable. A very large project, embracing canals from the right and left banks of the Gandak, which were intended to irrigate over 2 million acres, was seriously considered thirty years ago, and attention was called to it again in the report of the Famine Commission of 1880. The much smaller project known as the Tribeni Canal may be regarded as part of the original left bank canal. Earthwork was begun upon it as a famine relief work in 1897, and it was finally sanctioned on the 7th March 1901. The works are now being constructed.

420. The canal is to be taken from the left bank of the Gandak near the frontier of Nepal, and to run parallel to the foot of the hills in a south-easterly direction, irrigating from its right bank the country lying between it and the Sikrana river, and commanding an area of 427 square miles. It is designed for a discharge of 2,170 cusecs, and the area to be irrigated each year is estimated at 114,000 acres. The sanctioned estimate is Rs. 37,91,789. As it will directly cut across all the numerous torrents which flow from the Nepal Hills south to the Sikrana, the canal must be an expensive one. Its gross revenue is estimated at Rs. 2,45,000, in addition to Rs. 42,750 on account of enhanced value of land revenue. If these figures prove accurate, the capital cost per acre irrigated will be Rs. 33, that of the Sone Canals being Rs. 58. The economy in this case is due to no provision being made for navigation, and to the simple character of the head-works, as a weir across the Gandak is thought to be unnecessary. The canal could be extended by dropping it into the Thatharia river and taking it off again lower down, so as to water 115 square miles lying to the west of the Tilari river. We recommend that this extension should take place, and at our suggestion the Government have approved of the masonry works now under construction being enlarged, so as to allow of an increased volume being passed down the canal whenever it may be necessary. We do not doubt that in time the cultivators will learn to appreciate this canal as much as they do those of the Sone, and that it will prove in every respect a most valuable protective, perhaps even a productive, work.

421. *The Dhaka Canal.*—The only other State irrigation work now under construction in Tirlhut is a small one known as the Dhaka Canal; the water of which is to be drawn from the Lal Bakliya river, of which the minimum discharge in October is stated to be 300 cusecs. The estimated cost of this canal is Rs. 2,93,145, the area to be irrigated in the Dhaka Sub-division, 13,500 acres, and the revenue ultimately to be gained, Rs. 34,250. It is proposed to begin by charging a water rate of Re. 1-8-0 for rice and Re. 1 for the *rabi* crop. The canal was sanctioned in 1901, as a famine protective work.

422. *Torrents from Nepal.*—The torrent streams that issue from the lower Nepal Hills are subject to the disadvantage that the Nepalese have

it always in their power to dam up the channels and use the water for their own purposes. Nor can they be blamed for so doing, provided they do not waste water. But this being the case, it is only the larger streams, which they cannot entirely stop, that are worth examining for irrigation purposes. Of these there are three in Champaran—the Tilar, the Pussa, and the Bakhiya rivers—projects for the utilization of which are now under consideration. These streams were said to have a minimum discharge in October of 200, 150, and 200 cusecs respectively. But gauge observations taken for our information in 1901 and 1902 show that throughout September in the first of these years the discharges were so low as to be practically valueless, and that they were little better in the following years. Here, as on the Sone Canals, the crucial time for irrigation is the *hathia* in October; and if a certain supply cannot be guaranteed at this period, it is no use proceeding with these projects. Mr. Bernard, the Collector, bears testimony to the value of the irrigation schemes would be to the district; to the urgent need of artificial irrigation owing to the irregularity of the rainfall in October; and to the eagerness of the rayats to obtain water. But in view of the liability of the supply to fail utterly when it is most wanted, we cannot regard these projects as sound. It is, however, possible that relief labour might be usefully employed in excavating channels or *pains* taking off from these rivers, similar to the work referred to in paragraph 430 *infra*.

423. *Irrigation in Muzaffarpur.*—The district of Muzaffarpur is an alluvial tract of the greatest fertility, but subject to the drawback that, in parts, the rice cultivation is so highly developed that the failure of that one crop results in a heavy calamity over a considerable tract of country. The district is well watered; it has large expanses of swamp and *jhil*, and is crossed by numerous streams running diagonally from north-west to south-east, and connecting with the great boundary rivers,—the Ganges, Gandak, and Bagmati. From these streams a good deal of irrigation is carried on, and in the rains they flood the country far and wide.

424. *The Bagmati scheme.*—In this district a more considerable scheme than those dealt with in paragraphs 421 and 422 has been under consideration. The Bagmati is a much larger river than the Bakhiya; and in 1876 it was proposed to throw a weir across it, and to construct a canal calculated to irrigate 152,000 acres of *kharij* and 50,000 acres of *rabi*, at a cost of 41 lakhs. This scheme was rejected by the Government of India, but was revived on a smaller and less ambitious scale after the famine of 1896-97, and work was proceeded with for famine relief. A detailed project was then prepared for a canal to cost 9 lakhs omitting the weir over the river. This was condemned by Mr. Buckley, the Chief Engineer, who considered, as his predecessor Colonel Haig had done twenty years before, that a weir and proper regulating head sluices were quite indispensable; and this brought the question back to the estimate of 41 lakhs which had been rejected in 1876. For any project of a smaller scope the construction of a weir could not be justified. It seemed evident, however, that the larger work could never be remunerative; while, in the opinion of the Lieutenant-Governor, the arguments which had been advanced in its favour as a purely protective work were not sufficiently strong to warrant its execution.

425. This opinion we are inclined to accept, but with some reservation. The papers indicate that the project is likely to cost between 40 and 50 lakhs, but that the average gross revenue will amount to 1½ lakhs only, of which 1 lakh will be required for working expenses. Taking interest charges at 5 per cent., a rate which allows for interest during construction, the work is likely to impose a permanent charge on the State of between 1½ and 2 lakhs per annum. A Collector of long experience in this district considers that the probable cost of providing famine relief, within the tract which the canal would protect, is equivalent to an annual charge of Rs. 25,000. Such an estimate must be necessarily speculative; but if the cost of relief is no greater than this, we cannot but agree that it is not worth while for the sake of avoiding it to incur a permanent charge of 1½ or 2 lakhs. We are unwilling, however, to believe that it is hopeless to anticipate a higher average gross revenue than 1½ lakhs.

from a work which is capable of irrigating 200,000 acres, or an all round rate of only 12 annas per acre. It may not be possible to realize a higher rate than this in a district which can do so well without irrigation in years of ordinary rainfall, or in three years out of four. But after the experience gained on the Sona and Orissa Canals, we think that it should be possible to educate the people in the value of protective irrigation; and to induce them, within a reasonable period, to take long leases at rates not lower than those which are now realized on the latter canals, where irrigation is certainly not more valuable than it would be in Muzaffarpur. If the canal can be relied on to give unfailing protection to 200,000 acres in a year of drought at a capital cost of 50 lakhs, it cannot be regarded as very expensive; and if it were possible to increase the gross revenue within a reasonable time to $2\frac{1}{2}$ lakhs, involving an all round rate of only Re. 1-4-0 per acre on the whole area that can be irrigated, we think that the construction of the work would be justified on account of its protective value. We recommend, therefore, that detailed estimates should be prepared, although it may be advisable to defer its execution pending completion of the Tribeni Canal, and of the smaller experimental project in Darbhanga referred to in paragraph 429 below, when a better idea may be formed of the revenue which may be expected from works of this class. If this be done, and the estimate is generally approved, the work will be available for the employment of relief labour. We are not satisfied, however, that the smaller scheme of 1896 should be wholly condemned; and we think there may perhaps be a good case for completing it as a district work as proposed by Mr. Disney, the District Engineer, either at once or whenever it may be necessary to employ relief labour.

426. *Irrigation in Darbhanga.*—The physical characteristics of the Darbhanga district resemble in many respects those of Muzaffarpur. Numerous streams flow into the district from the Nepal hills, and south of the boundary stretches a broad belt of rice land. The whole of the district north of the Bagmati river was severely affected in the famine of 1896-97. There were, however, four tracts which escaped the effects of the drought, and in three of these the escape was due to irrigation from the rivers running through it. The fourth was a *rabi* tract. In this district two projects have been brought before us—the Dous and the Kamla irrigation schemes.

427. *The Dous project.*—The Dous is a minor river that flows from Nepal into the north-west corner of the district—a tract which was severely affected by the famine of 1897. There are no records of the discharge of this river, but it is known that it is dammed up by the Nepalese after November. If a volume of from 125 to 250 cusecs could be counted on during the *hathia*, an area of from 6,000 to 12,000 acres of rice might be watered. The evidence before us was, however, to the effect that although in ordinary years the rayats might take the water, they would certainly object to paying for it. There is no more to be said of this project, except that here, as elsewhere, measures should be taken to learn exactly what volume can be counted on in the rivers at all seasons.

428. *The Kamla project.*—We shall have occasion to refer below to the excellent work done on the river Kamla, by Mr. R. S. King, a sub-manager on the Darbhanga State. We have had to consider whether operations should not be entered on here, on a scale more extensive and more permanent than can possibly be secured by works of this kind, the success of which depends so much on the personality of a single individual. In 1877 a scheme was drawn up for providing irrigation from this river by a main canal $12\frac{1}{2}$ miles long, with three distributaries, to command an area of 460 square miles. The cost of the project, which was carefully worked out, was estimated at Rs. 10,41,000 and the area likely to be irrigated at 52,500 acres. From the actual results obtained by Mr. King, it is safe to count upon this estimate of area being realized, at least in years of deficient rainfall. In the matter of supply, requirements will be satisfied if water can be obtained up to the 15th October; and the estimate made by the Chief Engineer when the project was prepared, was that up to that date 600 cusecs would be obtainable in the driest years, and 900 cusecs in ordinary years. It is also established—

that the river is too large to be dammed up in Nepal before that date. There seems, therefore, to be no reason to apprehend that the supplies will ever fall short of requirements. As regards the demand for the water, there is no doubt that it would all be taken up in a year of drought. Such years occurred in 1888-89, 1891-92, 1896-97, and 1901-02. In the last two years the willingness of the people to take the water was fully demonstrated. It may be concluded that they would be certain to take it at least once every four years. How far they would take it in other years is a more difficult question. Mr. King and the District Officers entertain serious doubts whether they would take the water at all.

429. The arguments for and against the execution of this work are very similar to those which we have considered in the case of the Bagmati. In both there appears to be a water-supply that can be relied on—a point which, however, should be further established by a systematic record in future of September and October river discharges; and in both the estimated capital cost in relation to the acre to be protected is very low, or little over Rs. 20 per acre. Both works will have a considerable value, but both will entail a heavy permanent charge on the State, unless a higher revenue can eventually be obtained than that which the local officers now anticipate. But there is this difference, that the Kamla is only about a quarter of the size of the Bagmati, and its construction will, therefore, involve a much smaller financial risk. For this and other reasons, we recommend that a detailed estimate of the Kamla scheme should now be prepared; and that if the cost per acre is not much greater than now anticipated, or not more than Rs. 25 per acre, it should be sanctioned, and put in hand as soon as funds can be made available. We may observe that Mr. King has recommended that the western channel should be located three miles further to the west, where it will be less liable to injury from floods, and will command a greater area. In view of the severe distress to which these densely populated districts of Northern Bihar are subjected whenever there is a failure of the autumn rains, and of the means of reliable protection that are available, we are unwilling to admit that the cost of protection will exceed its value until the matter has been put to a crucial test. Such a test the construction of the Kamla project will afford at a moderate cost.

430. *Private irrigation works.*—In these districts, as in those south of the Ganges, a good deal of irrigation is carried on from *pains*, the property of the landowners. One satisfactory instance was brought to our notice of a *pain* made from the river Musan, in the north-western corner of Champaran. It was dug as a famine relief work in 1897, and since then has been under the charge of Mr. Sealy, the District Engineer. It irrigates an area exceeding 10,000 acres, in a strip of land about 15 miles long, and 3 or 4 miles in width. The necessary silt clearance and other minor repairs are done entirely at the cost of the cultivators who pay a cess on the area irrigated. Mr. Sealy makes a yearly budget of his requirements, and divides it proportionately among the cultivators, who pay in their money to the Collector. The amount is about 2 or 3 annas an acre; and at the end of the year the Collector has generally a surplus to be carried on to the next. Mr. Sealy says the system works without any trouble, and he would not hesitate to apply it to masonry works, were it found desirable to construct them.

431. Under the enlightened orders of His Highness the Maharaja of Darbhanga private irrigation works on a much larger scale have been carried out with great success by Mr. R. S. King, who has skilfully utilized the water of the Kamla river. In May 1897, Mr. King spent about Rs. 10,000 in channels and temporary dams, diverting the Kamla water to the east into old channels of the river, from which it could be carried by *pains*, or village channels, into adjacent rice lands. In this way he saved 22,000 acres of rice. Again in May 1901, he added a fresh channel $1\frac{1}{2}$ miles long, and in the scanty rains of that year he secured the rice crop of 35,200 acres situated in 42 villages. In the November following he made a temporary dam across the river, turning its whole supply into the dry bed of the Jibach river, and secured a good *rabi* crop at an outlay of Rs 4,000.

432. The excellent results attained by Mr. Sealy and Mr. King, and by the managers of other estates and factories, show how much can be done, by active and energetic officers of long local experience, to utilize the available water-supply in seasons of drought by temporary and comparatively inexpensive expedients adapted to the exigencies of the moment. Work of this kind cannot, however, be carried out conveniently through the agency of the Public Works Department. A manager of private estates has a much freer hand in undertaking measures for the benefit of his tenants than can be given to a Public Works officer. If Government make a canal it is expected to pay high compensation for all the land occupied, to provide crossings at all village roads, and to incur charges and liabilities which are really prohibitive in the case of works required to meet temporary emergencies. Above all a direct return of some kind is expected on the outlay, which involves the introduction of a scale of charges, and consequent inquisitorial measures which are certain to be unpopular and also costly. We think it almost certain that a great deal could be done for the protection of these districts at a comparatively small expense, and at a cost that would fall far below the net cost to the State of any ambitious system of permanent works, if in seasons of drought prompt measures could be taken for throwing earthen dams across the principal streams at the earliest possible moment, and for diverting the water through the network of channels already existing, connecting or closing these channels where necessary.

433. *Assistance to District Boards in carrying out relief works.*—In these districts there are able and highly qualified District Engineers, who have held their appointments for years and know almost every square mile of their charges, and on the District Boards there are many European gentlemen of great ability and resource, who have an equally intimate experience of the requirements of the district. With such an agency available, it should be possible to keep up programmes of useful works which should be undertaken at the first warning of a failure of the rains or whenever expedient, and to modify them when necessary according to the exigencies of the moment. We think that a comprehensive survey of the country should be made under the supervision of the District Boards and their District Engineers, with the object of ascertaining the most suitable sites for temporary dams and head-works, and of determining the cuts and channels which should be made for the purpose of leading water on to the lands in years of drought and short rainfall. The Boards, which are at present prohibited by law from undertaking or incurring expenditure on works of irrigation, should be duly empowered to execute such works, whenever, in the opinion of the Local Government, the emergency has arisen, or threatens to arise, which would render such action desirable. We have it in evidence that a certain amount of money could, if necessary, be made available by the Boards for these purposes. As it is, they are not infrequently under the necessity of setting aside, in years of scarcity or threatened scarcity, considerable sums for the provision, in threatened areas, of employment on works which are not always of unquestionable utility. In the year 1901-02, no less than Rs. 71,000 was reserved for this purpose in the district of Darbhanga, in expectation of famine which fortunately did not occur. Had this money been expended in the way which we have advocated, and with the same happy results as have been attained by Mr. King, irrigation might have been provided for between 150,000 and 200,000 acres of winter rice. Such sums as may be allotted by the Boards should be promptly and liberally supplemented by loans or grants-in-aid from Government. And whenever it was shown that the money had been wisely spent, the sanction of Government should not be withheld, even though an immediate and direct return should not be expected. By these measures considerable areas might be protected in addition to those which may be commanded by large works made by Government agency, such as the Bagmati and Kamla schemes; and the cost would, in many cases, impose a smaller burden on the State than would be involved by the construction of permanent works, which, in all probability, can never be made remunerative in districts where irrigation is comparatively seldom required. The help of the District Board and its officers might be utilized in the preparation of a comprehensive programme, for famine relief purposes, of similar works such as *pains*, cuts

connecting rivers and streams for improving the distribution of the rainfall, and for the filling, by means of channels from sluices in the river embankments, of any tanks which can be used for irrigation, and of the depressions and swamps, known as *chaurs*, which hold water essential for the rice crop in the low-lying parts of the country. For this purpose it would be necessary to give the District Engineer the help of a special staff and establishment.

434. *Question of an irrigation cess.*—But although we consider that in granting money Government should not insist, as a *sine qua non*, on an immediate return, we are strongly of opinion that efforts ought to be made to obtain, both from owners and occupiers, some equitable payment for the undoubted benefits which they will derive from the proposed works. As regards the occupiers, we have it in evidence that in years of scarcity and short rainfall they might pay as much as Re. 1-8-0 or Rs. 2 per acre irrigated. Such a return would go far to cover the actual outlay on works as successful as Mr. King's. But if the cautious views of the Local Officers are accepted, there would be little return in ordinary years; and when the expenses of collection, which might be heavy, are deducted, there would remain little to cover the cost of maintenance, which, despite the more or less temporary character of the proposed works, it would be necessary to incur. Nor should the proprietors of estates benefited be exempted from contributing a fair percentage on the cost of the works, or an adequate guarantee for its repayment. The mode of obtaining such a return or guarantee from proprietors has been much discussed by us in the course of our inquiries, and unfortunately presents many difficulties.

435. These difficulties were recognized by some of the representatives of the planters who came before us; and it was suggested that they might be met by the imposition of an irrigation cess on the whole district from which a fund might be formed for the maintenance of protective works, and the payment of a moderate rate of interest on the capital provided by Government. It was contended that the district as a whole benefited by works which reduced distress in seasons of famine; and that the cost of assessing and collecting a water rate on the particular lands to which water might be supplied in each season, would form a very high proportion of the amount collected, and would be very unpopular. Mr. Hare, the Commissioner, recognizes the objection to a water rate in districts in which the demand for water is so intermittent, and proposes a small annual cess, which, however, would be limited in its application to the areas actually protected by the works. He writes—

I would recommend definite recognition and acceptance of the principle that, in the case of schemes in which the demand for water is intermittent and consequently the receipts for the sale of water are irregular and uncertain, a cess should be levied on the lands protected by the scheme—

- (a) The benefits are so great as to recover ample return to the cess-payers.
- (b) The payment is in the nature of an insurance against failure of crops and famine which should be borne by the areas protected.

The proposal to levy a cess over a whole district or portion of a district, in consideration of benefits conferred on a limited number of owners, is, in our opinion, quite inadmissible; but we think that there is a great deal to be said for Mr. Hare's proposal. The advantages of such a system, in the particular circumstances under consideration, are so obvious that it is unnecessary to dwell on them. We apprehend that a cess could not be introduced without legislation, but we think that there may be a sufficient strength of public opinion in favour of the proposal to justify legislation. The rate of the percentage to be paid on the capital advanced will be a matter for consideration; but inasmuch as protective works in these districts are never likely to be directly remunerative, we think that Government may well be contented with a percentage less than the market rate of interest, or no higher than that which would be deemed sufficient to justify the construction of ordinary departmental protective works in the districts standing in equal need of protection. The agreement would ensure to Government a certain and regular revenue in return for the outlay incurred; but it would have an even greater value in preventing expenditure on speculative and ill-considered schemes, which may

443. It may be said that the failure of the arrangement described in paragraph 438 shows that a voluntary cess, such as we have recommended, may be expected to break down in practice. Apart from the fact that the original agreement expired after ten years and that its renewal could not be enforced, there were special reasons for the failure. The works, as actually constructed, appear to have been of little real benefit; and it is doubtful whether the protection afforded was equivalent to the charge made for it, except in the year 1884. Those who were most interested had little or no voice in the management, which was entirely under the Public Works Department, although a work of this kind was one for which departmental management was very unsuitable. The guarantors complained that many of the provisions of the agreement had not been duly observed by Government, and that they were asked to renew on terms much less favourable than those of the original agreement. The evidence and papers on this subject indicate that there were faults and mistakes on both sides; but we do not think that the arrangement was in principle unsuitable, or that either a water rate assessed on the area irrigated in each season, or a compulsory cess on the whole district, would have been a more workable or appropriate arrangement.

SECTION V.—CHOTA NAGPUR.

444. *General conditions.*—This province is of a totally different character from that of the Bengal plains. Geologically it is of gneiss formation, and consists of broken hilly country, much of it at an elevation exceeding 2,000 feet. The British portion of Chota Nagpur consists of five districts enclosing an area of 27,000 square miles with a population of 4,900,429 or 180 to the square mile. The population, chiefly aboriginal Kols, are poor cultivators, backward and scattered. Much of the province is under forests, and, as in the neighbouring parts of Orissa, *mahua* and other forest produce form a very important part of the food of the poorer classes in ordinary times, and go far to help them when the rice crop fails. The Tributary Native States, which in general lie to the south and west of the British districts, are still more backward and thinly peopled. They cover an area of 16,027 square miles with a population of only 890,834, and consist of a confused mass of hills, ravines, and plateaux. A large area is covered with valuable *sāl* forests, and they contain much mineral wealth still undeveloped. The annual rainfall of Chota Nagpur generally exceeds 50 inches, and even in the driest year, only in one district has less than 35 inches ever been recorded. Failure of crops then can hardly be attributed to want of rainfall, but to its not falling at the required season; especially when it ceases as early as the middle of September, the October rainfall being of exceptional value. The assurance given by artificial irrigation to the success of the rice crop is highly appreciated; while the District Officers estimate that even in ordinary years the produce of irrigated rice lands is 25 per cent. more than that of unirrigated.

445. Chota Nagpur is not a province in which great irrigation projects could ever be carried out. There exists everywhere a system of damming up valleys by a succession of *bands* from 8 to 10 feet high, thus forming small tanks or *aharas*. These are not generally supplied with masonry sluices, but the water soaking through them serves to irrigate rice patches on the downstream side; while, in the bed of the tank itself, as the water is drawn off, wheat or gram are sown in the moist ground, and a good *rabi* crop is obtained. There are many thousands of these *bands* and *aharas* throughout the province, and we had universal testimony that they are everywhere neglected. The beds of the *aharas* are silted up. The *bands* are worn down and out of repair. In the repair of these *bands* and the increase of their numbers lies the advancement of irrigation in Chota Nagpur. In this undulating tract, with its copious if irregular rainfall, there must be numberless small streams the waters of which could be dammed and diverted into tanks, and utilized in saving the crop at critical seasons. Our evidence indicates that the construction of smaller works of this kind has led to an increase in the value of produce, and to a rise in rents which has rendered the expenditure highly remunerative; and we have no doubt that this will generally be the case where the works receive the personal attention of a capable manager.

446. *Obstacles to extending irrigation.*—An initial difficulty connected with the construction of protective works by the State is that Government will not be able to secure any return on its expenditure in the form of an occupiers' rate, such as is levied on large irrigation works but is quite unsuitable for works of the class proposed. This is of little importance in the case of lands of which Government is the proprietor, as it can derive at any rate at the next revision of rents proportioned to the expenditure in the form of an enhancement of rents. But in the case of improvements settled lands Government will get no return at all, and for permanently in these lands reliance must be placed on the efforts of either the landowners or the tenants; and it is on their efforts that the extension of irrigation in Chota Nagpur must to a very considerable extent depend. The chief obstacles are the impecunious and improvident character of the landowners, and the unprotected conditions under which the tenant holds his land. To deal first with the tenantry. There is as yet no tenancy law in Chota Nagpur, and every tenant is virtually a tenant-at-will, his rent being liable to enhancement at the caprice of his landowner. The introduction of some kind of tenancy law appears to be eminently desirable. The Commissioner, Mr. Slacke, is, however, not prepared to recommend that the precedent of Bengal should be exactly followed; and he considers that a temporary exemption from enhancement of rent on account of improvements executed by the tenants would, in the circumstances of the province, be sufficient for the present. The point is not one on which we need offer an opinion. But exemption for a period sufficiently long to make it worth while for the tenant to improve ought to be given. Mr. Slacke has little hope of inducing the landowners to execute improvements. But Mr. Lyall, the Deputy Commissioner of Palamau, takes a more hopeful view as regards his district, and believes that he could advance quite a lakh of rupees in it at present, and more hereafter. Mr. Slacke also admits there are a few well-to-do and prudent landowners who might be induced to make improvements if they were supplied with funds by means of *takavi*, and believes that in his division he could distribute fully four lakhs a year. Advances should, we think, be freely made, and on liberal terms.

447. *Irrigation in Estates.*—One peculiar feature of the division is that two-thirds of it is under Government, either as proprietor in the case of Government Estates, or as Manager in the case of Encumbered Estates or of Estates under the Court of Wards. In all three classes of estates, much more might apparently be spent than at present on useful works of irrigation. In the case of Government Estates the tenants have been granted a settlement, and it has been thought undesirable to such enhancement prior to its expiry. Apparently there is no legal obstacle to such enhancement executed otherwise than by the tenant; and to the holding by an improvement in consideration of increased value imparted with the propriety of such enhancement has been affirmed in all Indian tenancy laws with which we are acquainted. Moreover, according to Mr. Lyall, the tenants would be perfectly willing to pay the enhanced rent for the sake of irrigation. In these circumstances there would seem to be no impropriety in the levy of an enhanced rent on so much of a tenant's holding as is found to have received benefit from an irrigation work made or improved by Government on any of its estates. Care would of course be taken not to levy the enhanced rent until the beneficial character of the improvement had been demonstrated beyond doubt. And careful distinction would have to be made between real improvements and those repairs which are required in order to maintain the efficiency of existing works. Scrupulous care ought, in our opinion, to be taken to see that Government does not on its own estates incur, even partially, the reproach of neglecting those repairs of irrigation works for which landlords are liable according to the custom of the country. In the case of Wards and Encumbered Estates, Government is in a position to enhance rents on the tenants with the same freedom as private landowners; and in the former, as on its own estates, Government should execute without hesitation or delay such improvements as a solvent and prudent landlord would be willing to undertake. On Encumbered Estates the sole object of clearing off the liabilities within the shortest possible period, and any scheme which does not provide

clearing them within fifteen years is generally rejected by superior authority. According, however, to the provisions of the Encumbered Estates Law regarding appropriation of the assets, full equality, if not actual priority, is given to the execution of improvements over the clearing of the liabilities; and this provision would seem to justify a liberal expenditure by Government on the execution of improvements out of the revenues of Encumbered Estates while they are under management. If these principles are accepted, it is clear that there is a considerable field for the improvement of irrigation in Chota Nagpur by Government in its capacities of landlord and manager. And if our views of the duties of Government are accepted, we think that a comprehensive investigation should be made, under competent professional advice, into the requirements of the three classes of estates which we have specified; and that funds should be liberally allotted for such works and improvements as may be approved.

448. *Projects in Palamau.*—Among minor irrigation works our attention has been drawn to five small projects for utilizing the waters of certain streams in Palamau—the driest and probably the poorest district in the province. Two of these projects consist of building a weir across the rivers Nadaura and Piri, tributaries of the Amnat, itself a tributary of the Koil, and of constructing distributary channels. The third is for a weir across the Suddaban, a tributary of the Koil, with a distributary channel. The other two projects are for the construction of two small reservoirs at Pakraha and Dhawadih. Particulars are given below, but it must be observed that the information regarding the discharge of the rivers is very meagre and uncertain :—

| Name of project. | Catchment basin. | Discharge available. | Area to be watered. | Total estimated cost. |
|------------------|------------------|--|---------------------|-----------------------|
| | | | Acres. | Rs. |
| Nadaura . . . | 8 square miles. | 100 cusecs in September; dry in November. | 2,700 | 77,400 |
| Piri | 20 " " | 240 cusecs in <i>khari</i> | 12,000 | 1,77,000 |
| Suddaban . . . | 22 " " | 200 cusecs in December | 12,500 | 1,58,000 |
| Pakraha . . . | 600 acres. | 13½ million cubic feet to be stored. | 1,000 | 39,000 |
| Dhawadih . . . | 125 " | 9·5 ditto . . . | 108 | ... |

It cannot be pretended that much reliance can be placed on these figures, especially on the discharge of the rivers. The reservoir schemes hardly need further consideration; and all five have such small catchment basins that a failure of rain in the field to be watered must imply a like failure in the gathering ground. It is, however, desirable to see what can be done by diverting flood water by means of cheap weirs, into a succession of *aharas* where it can be stored up for future use. We agree then with Messrs. Slacke and Lyall in recommending that a trial should be made of one of the three weir projects.

449. Of the 2,700 acres to be protected by the Nadaura project only 1,000 acres are Government land; and it has been proposed that the works should be restricted to what is necessary for the irrigation of this land, in which case the cost is estimated at Rs. 37,000. The larger scheme is of course to be preferred if the landowners will contribute a fair share of the cost, failing which the smaller scheme must be considered on its merits with the Piri and Suddaban projects. We should add that the Public Works Officers are less sanguine of the success of these schemes than the Civil Officers, and think that they will often fail to protect the crops at a critical period. This apprehension appears to be based rather on the results of experience on the Sone Canal, and other works in Bihar, than on actual practice in Chota Nagpur, in which there are no departmental irrigation works. The real question is whether the works will increase the security and the profits of cultivation to such an extent as to justify an enhancement of the rents. On this point we attach weight

to the opinion of the Civil officers, and recommend the construction of one work tentatively, or as an experiment which at the worst is not likely to prove very costly.

450. *Korarbar and Karo projects.*—Two other irrigation projects were brought to our notice in Chota Nagpur, the Korarbar and the Karo. The former scheme is to irrigate a gross area of between 40 and 50 square miles on the left bank of the Korarbar, a tributary of the Sone. From the statistics given it is clear that this project is only practicable if combined with water storage, and we have no information before us as to whether this is possible. The information about the Karo is a little fuller. It is proposed to build a weir across the river, about 30 miles south-west of Ranchi (a tract which suffered severely from famine both in 1897 and 1900), and from its right end to construct a canal commanding a gross area of over 200 square miles. From discharges taken it seems probable that 200 cusecs could be relied on in the month of October. We recommend that this project be carefully worked out.

451. *Need for expert assistance.*—It is evident that the irrigational resources of Chota Nagpur have not yet been thoroughly explored. As already stated, this is not a province for large works. We would recommend that for five years an intelligent Engineer should be attached to the Commissioner. His duty would be to put himself in communication with all the district officers and others acquainted with the country, and to submit from time to time projects for improving the irrigation. A budget provision, not exceeding one lakh per annum, might be reserved for the execution of these works, which, if they failed to afford full protection against famine, would at least place the inhabitants in a much better position to combat it.

452. *Relief works.*—The silt clearance of *aharus* and the repair of *bands* afford an excellent form of famine relief labour. It may be objected that this is expending public money on the improvement of private property. Were it a question of repairing a few large reservoirs situated far apart this argument would have force. But where nearly every village has its *aharas*, it is not only their owners that derive benefit from them, for it is the interest of all that they should be in good order. If a contribution can be obtained from the owner it should be taken, but the work should not be allowed to perish owing to his indifference or impecuniosity.

453. *Contrast between Chota Nagpur and Sonthal Parganas.*—In contrast to the unsatisfactory state of affairs in Chota Nagpur it is a pleasure to call attention to the good work going on in the neighbouring district of Sonthal Parganas, regarding which we have received a most interesting note from Mr. H. Macpherson, the Settlement Officer. The progress is due to the energy and power of co-operation of the rayats, and to the judicious course of legislation. Here, as in the neighbouring districts of Chota Nagpur, the landowner does nothing to assist his rayats in improving their lands. But here, at least, he is powerless to interfere. The result of an agrarian agitation in 1873, against the uncontrolled enhancement of rents by the proprietors, was the enactment of a law under which the rentals of the whole district were settled by Government officers for 15 years. At the end of this period they were made subject to alteration, only by the order of the Settlement Officer, and they have practically remained unchanged for 25 years, during which the area of cultivation has risen from 208,178 to 332,832 acres. To quote the words of Mr. Macpherson—

The land system of the Sonthal Parganas is one which lends itself with peculiar advantage to co-operation amongst the cultivators of the soil. The unit is the village. At the head of almost every village there is a headman. The headman is the representative of the village through whom the villagers as a body deal with the proprietor. The proprietor is merely the rent receiver, and has no part in the management or internal economy of the village.

His interference, if he is at all disposed to interfere, which few landlords in the Sonthal Parganas are, is liable to be checked at every turn by appeal to the local officer, who, besides being the Court of Civil and Criminal Justice to the people, is their active and sympathetic

safeguard against every form of oppression that may be practised by headman or proprietor. The headman is appointed by, and is liable to be dismissed by, the District Officer. Hence it is that in the Sonthal Parganas the village communes, with its headman and elders, flourished with a very strong and vigorous life. The faculty of association and co-operation, has been fostered and developed to a degree that is impossible in the ordinary district. It is this faculty of co-operation, to which, I think, is chiefly due the very extraordinary utilization that has occurred of the natural irrigational advantages of the district. Works that have been beyond the means and enterprise of the individual cultivator have been successfully carried through by the united efforts of the community, each member of which has shared in the general resultant good; and co-operation has told not only on the work of construction but also on the work of maintenance and repair. By a special provision of the village record-of-rights and duties, which was framed 25 years ago and has now been renewed, it is the duty of the headman and rayats of a village to maintain and repair all the village *bunds*, tanks, and other works of irrigation. While speaking of the record-of-rights, I may note another of its special provisions, namely, that without reference to the proprietor any rayat may construct embankments and like works for purposes of reclamation and irrigation, provided he does not thereby cause injury or loss to others. This clause removes the proprietor from interference with the work of improvement, and leaves the individual rayats and the community free to think out and execute their own ideas of improvement.

454. The Sonthal is an active irrigator. As he reclaims land from the jungle he terraces the slopes, throws embankments across the depressions, and dams the streams, thereby diverting the water on to his fields. But Mr. Macpherson seems to think that there is reasonable hope of constructing larger irrigation works than these in this district; and he advises that a qualified Engineer be sent for a year to make a careful study of the ground, decide on the sites for irrigation works, and prepare rough estimates of their cost. When an officer can be spared this would no doubt be a useful measure. The Sonthal Parganas are not in need of much famine protection. In 1896-97 there were on an average 1,790 people a day on relief works. The mean annual rainfall for the last 10 years has been 52·7 inches; the maximum in 1893 was 71·27 inches; the minimum in 1895 was 38·96 inches.

SECTION VI.—GENERAL.

455. *Schemes in Nadia district.*—In the previous five sections we have described those parts of Bengal which we visited, and where there were either existing works of State irrigation, or proposals had been made or cause had been shown for the execution of such works. We have had evidence, however, that in other parts of Bengal there have been occasionally seasons of great scarcity and distress. Perhaps this is most marked in a portion of the district of Nadia with an area of 1,182 square miles and a population of 630,558. Here, in the famine of 1896-97, there were 28,000 people on relief works, and 83,000 receiving gratuitous relief. Regarding this distress Mr. Finucane, the Commissioner of the Division, testifies from his own personal knowledge "that the distress in parts of Nadia, and the failure of the crops there, was far greater than in Saran, and that the people there were quite as impoverished." He called our attention to two irrigation schemes proposed by Rai Bahadur Dwarkanath Sircar, who was for many years Engineer of this district. The first of these schemes is to irrigate the *doab* lying between the Bhagirathi and the Telungi, by means of a canal about 80 miles long taken from the Ganges. This, it is estimated, would cost about 10 lakhs. It would require masonry head-works, and the people would, it is said, be willing to pay 6 annas per acre watered, per annum. No information, however, is given as to the size of the proposed canal, or the area to be irrigated. The Rai Bahadur's other scheme is for the canalization of the river Bhairub. We would suggest that these projects should be worked out sufficiently to enable Government to decide on their feasibility. They might prove a valuable form of famine relief works: on the other hand, it is right to add that Mr. O. S. Smith, Executive Engineer of the Nadia Rivers Division, pronounces against the practicability of any irrigation works in this district.

456. *Private works in Monghyr.*—Our attention was called by Mr. Williams, Commissioner of Bhagalpur, to an excellent private irrigation scheme in the Monghyr district known as the Gorakhpur Irrigation Work, which was executed in 1875-76 by Colonel Money, then Manager of the Darbhanga Estate, and which

of Mr. Tytler to which allusion will be found in paragraph 463 *infra*, show that something might be done by the judicious advance of money to small landowners and substantial tenants for the construction of permanent wells. We think that systematic inquiry should be made throughout Bihar, and especially in the western and central portions, with the object of determining the places best suited to irrigation from permanent wells; the possibility of reaching for that purpose the subsoil spring supplies, by penetration of the clay beds; and the feasibility of extending further the practice of irrigation from temporary wells, which has proved in famine years so valuable a resource in the eastern districts of the United Provinces. It would be worth while to depute an intelligent officer of the Agricultural Department to those districts to acquaint himself with the practices there, and to ascertain whether the obstacles to their extension into Bihar are surmountable or not. Experiments based on the information thus obtained might be tried on estates under Government management, where cultivators from the well tracts of Saran or the United Provinces might be given leases of lands, and *takavi* for the construction of wells. It is impossible, on the vague and imperfect information now available, to say what the result of these measures would be. But if it were found possible to teach the Bihar rayats to cultivate *rabi* with profit by means of permanent wells, and by means of temporary wells to save or sow a *rabi* crop in a bad year, a valuable resource would have been found for many of them in times of drought.

460. *Takavi*.—A matter which has hardly been brought to the test of experience in Bengal, is the extent to which the execution of private improvements can be stimulated by advances of *takavi*. The total sums advanced during the last ten years amount to only $10\frac{1}{2}$ lakhs, or about one lakh per annum. Of this total sum Rs. 6,65,000 were allotted for works of irrigation, mostly tanks and *aharas*; and of this Rs. 3,32,000 were distributed during the famine year of 1896-97, and only 3,33,000, or less than 40,000 per annum, during the remaining years. The single district of Gaya accounts for Rs. 2,83,000, of which Rs. 1,04,000 were advanced in the famine year. These sums are extraordinarily small for such a large and populous province as Bengal. The reasons stated are those usually given, such as the unpopularity and cumbrousness of the system, the absence of demand, and the like. We were also told that appreciable discouragement had resulted from refusal by the Imperial Government of allotments applied for by the Local Government. But we fear that a more potent cause than any of these is the usually faint interest taken in the matter, except on the occurrence of exceptional calamities, when large sums are advanced under the Agriculturists' Loans Acts. We have it on the evidence of most competent officers, including our local colleague, Mr. Allen, that much larger sums might be advanced for the construction, repair, and improvement, of wells, *aharas*, and *pains*; and we recommend the general adoption of a more vigorous policy. For remedy of defects in the system we have not many suggestions to make, beyond those put forward in the general chapter on the subject. But we think that powers of granting *takavi* should be conferred as a matter of course on all officers in charge of sub-divisions of districts, and on selected officers subordinate to them. The aid of the more intelligent European planters and landowners might perhaps be enlisted in the distribution of advances. Officers should take money with them on tour, make inquiries and distribute the money on the spot. Where there was reason to believe that large sums could be distributed with advantage, and that the work would be too much for the officer in charge of the sub-division, special officers should be entrusted with the duty. Some use might perhaps be made of the officers of the Opium Department, who have considerable experience in the business of distributing advances and selecting proper recipients.

461. The bulk of advances for the wells and smaller works will be made to the smaller landowners and substantial occupancy tenants. In the case of the former the question of security offers no difficulty. The latter also are protected in perpetuity against enhancement of rent in respect of improvements executed by them. But as, in general, they do not enjoy the power of transferring their land without the consent of the landlord, it cannot as a rule be taken as security for the advance. There will probably be the same reluctance in Bengal as we have found in the United Provinces, to making the tenant's interest

in his holding transferable for purposes of recovery of *takavi*. We know of no circumstances special to Bengal to render inapplicable to it the recommendation which we have made on the subject (I, 181)—that the precedent set by the Central Provinces in this matter should be followed.

462. *Village tanks*.—Throughout Bengal and the eastern districts of the United Provinces, village tanks are formed not, as elsewhere in India, by damming up valleys and holding up water, but by excavation out of the soil, the rain water from the neighbouring ground surface being turned into them. These tanks are no doubt of great value for watering cattle and other domestic purposes; but they are also used for irrigation, and in the climate of Bengal they may be counted on to fill two or three times in the year. The area they command must be very limited, and in drought they are the first to fail. Nevertheless tanks are popular. In the course of years they get silted up, and, except to supply relief labour, it is far too costly an undertaking to clear them out. But silt clearance of such tanks is excellent for purposes of organization in the employment of relief labour.

463. *Mr. Tytler's encouragement of wells*.—We have received a very interesting note from Mr. A. Tytler, C.I.E., who for thirty years was in the Opium Department in North Bihar. He divides irrigation water into three classes according to its merit—

- 1st.—*Jhil* and tank water.
- 2nd.—Well water.
- 3rd.—Canal water.

He places *jhil* water first, on account of the decaying vegetation which it contains and which forms a good manure. Tank water he thinks good "because it receives surface drainage." Well water he thinks good "because it contains in solution fertilizing saline substances," and also "because it is, when used as is usual during the cold weather, warmer than the atmosphere." Canal water is placed last because it contains no fertilizing properties, and is colder than the atmosphere; also because it recklessly over his crops and is detrimental to their detriment. Mr. Tytler considers canal irrigation in Saran not only it without personal labour, and therefore pours it recklessly over his crops, superfluous but harmful. He thinks it is only wanted for rice irrigation about once in five years, and he remarks "if used for cereals it is apparently suited for the first year, though each succeeding year the crops become worse, the yield lighter, the soil deteriorating." He adds that irrigation raised the naturally high spring level to near the surface of the ground, which brought on a most fatal fever which disappeared when the irrigation ceased. The mortality of the cattle also, he says, was excessive. Mr. Tytler recommends, then, the multiplication of tanks and wells, the latter in the higher lands at the rate of a good well for every 10 or 15 acres. His personal influence in North Bihar was very exceptional, and he succeeded in persuading the cultivators to take advances *collectively* for masonry wells, that is, "the number of men who would use the well or be benefited by it agreed to repay the loan proportionally according to the area of their poppy fields." By proceeding in this way, in 25 years Mr. Tytler increased the number of masonry wells in his district by 3,705, besides repairing 845 old wells. The amount advanced was Rs. 1,86,695, and, he writes, although "this large sum of money has been advanced to poor cultivators, in nearly every case so poor that no single man could afford to singly take the money, but required to have numerous partners in the undertaking, yet there never has been a single rupee repaid in arrears, nor have I ever had occasion to distrain security." Mr. Tytler attributes this success simply to getting the cultivators to act *collectively*; and we think the success worthy of record and capable of imitation. The sum advanced by him never exceeded Rs. 60 for a well, the cost of which was from Rs. 100 to Rs. 150, and the wells that were made proved of great benefit to the cultivators for the growth not of the poppy only, but also of other valuable crops.

464. *Famine relief works*.—The Bengal Government have favoured us with statistics concerning the thirty-seven districts or parts of districts which they

consider liable to famine. They embrace an area of 83,459 square miles with a population of 33,567,821, or about 400 per square mile. In twenty-five of these districts the average rainfall of the year exceeds 50 inches, so that in these there is no very urgent need for providing relief works. Provision has been made, however, in each district for the employment for three months of, on an average, 9·3 per cent. of the population of the area affected. The works on the programme are—

- (a) Railway embankments.
- (b) District and village roads.
- (c) Tanks for irrigation and drinking purposes and irrigation channels.
- (d) Embankments against floods.

Railway embankments could only be helpful to the people in the immediate vicinity of any line proposed, and quite possibly there might be no distress just in that area. Usually the preference is for roads over irrigation works, perhaps, as the Commissioner of Patna remarked, because “the Collector knows roads and not canals.” We think this preference often unfortunate, leading to making roads where they are not wanted, and where District funds cannot afford to maintain them. The tanks for irrigation and drinking purposes are merely village tanks, but some of them are of great size, and many were constructed in the famine of 1897. They are of use for watering cattle, and sometimes small plots of land are irrigated on their margins, but they cannot be regarded as irrigation works. We earnestly recommend then that, where irrigation is practised at all, the opportunity of a demand for famine labour should not be lost; but that *pains, aharas*, the embankment and terracing of fields, and every other sort of irrigation or drainage work, should be put thoroughly in repair. Expert knowledge is hardly required for the silt clearance of a tank or an irrigation channel, or for the building of a village *band*. New works of course require more technical knowledge; but no form of famine labour is better, when expert supervision is possible, than the excavation of a new canal like the Tribeni.

(i).—*Local conditions ; use and value of irrigation.*

465. In considering the value of irrigation in the United Provinces it will be convenient to regard them as divided into four nearly parallel strips, as follows :—

- (1) *The sub-montane tract or zone* ; a narrow strip, 30 to 50 miles in breadth, extending under the Himalayas, along the whole length of the Provinces.
- (2) *The central tract* ; lying between the sub-montane tract and the Ganges.
- (3) *The Ganges-Jumna Doab* ; extending from the foot of the Siwaliks to the Junction of the Ganges and Jumna rivers at Allahabad.
- (4) *The southern tract* ; lying south of the Jumna river.

Each of these tracts has special characteristics, and requires separate consideration.

466. *The sub-montane tract.*—All the districts in the immediate vicinity of the hills, from Dehra Dun on the west to Gorakhpur on the east, lie wholly or partly within the sub-montane tract, but in most of them the conditions in their southern portions approach those of the second tract. From its situation this zone has naturally an abundant rainfall, and its surface is intersected by innumerable streams. A great part of it is devoted to forests and grazing lands. The population is in most places sparse, and agriculture is in a very backward condition, the progress of the tract being much impeded by its malarial climate. The average annual rainfall varies from under 50 inches along the southern border, to upwards of 70 inches at the foot of the hills. The winter rainfall gradually decreases from 7 inches on the west to about 2 inches in the eastern districts. Rice and wheat are the principal crops. The former is freely irrigated from streams and canals, but the water being near the surface the moisture of the soil is sufficient for wheat and other *rabi* crops, except in the peculiar *Bhabar* tract in the Naini Tal district, where, at the foot of the steeper slopes of the hills, there is a broad talus of boulders and gravel through which the subsoil water flows at a great depth.

467. The chief value of irrigation in this sub-montane tract is the benefit which it affords to the rice crop. Without it the better qualities of rice cannot be grown ; and even the coarser kinds are improved by it in almost all years. Serious deficiency of the rainfall is a rare occurrence, but the northern portions of Gorakhpur and Basti suffered severely from this cause in 1873 ; and both those districts, with Bijnor and Bareilly, are said to have lost all their rice crops in the drought of 1877. The average area sown, in the districts lying wholly or partly within this tract, is about 10 million acres, of which rather less than one-fifth is irrigated in a dry year. One-half of the irrigated area is due to wells, the remaining half being divided fairly equally between Government canals, tanks, and ' other sources.'

468. *The central tract.*—The zone between the sub-montane tract and the river Ganges is the largest of the four tracts into which we divide the Provinces, and it comprises more than a third of the total cropped area. It is composed of Rohilkhand, Oudh, and the Gorakhpur Division, excepting the relatively small portions of their areas which lie in the sub-montane tract, and of the Benares Division, except the portion south of the Ganges. Within this tract the average annual rainfall varies from about 35 inches along the course of the Ganges river, to nearly 50 inches along the southern border of the sub-montane tract. The average winter rainfall (December to April) is approximately 2 inches over the whole tract, varying from $2\frac{1}{2}$ inches in the western to $1\frac{3}{4}$ inches in the southern and eastern districts. Like the sub-montane tract this large area is liable to suffer only occasionally from deficiency of the monsoon rainfall, but the scanty winter

rainfall is generally insufficient to ensure a full outturn of the *rabi* crop without aid from irrigation. Since the end of the eighteenth century there has been no widespread famine affecting severely the whole tract, but the western districts of Hardoi, Moradabad, and Budaun, with the southern portions of the adjoining sub-montane districts, suffered severely in 1837, 1860, 1869, and (excepting Moradabad) again in 1877, when Lucknow, Rae Bareilly, Bara Banki, and Azamgarh also suffered severely. In 1896-97 there was famine in Hardoi, severe distress in Sitapur, Lucknow, Bara Banki, Unao, Rae Bareilly, Jaunpur, and Azamgarh, with slight distress in every other district except Ghazipur and Ballia.

469. Irrigation is extensively practised from wells, and *jhils*, or natural depressions, which occupy considerable areas in almost every district; rice, wheat and barley, sugar-cane, poppy and indigo, all of which are more or less dependent upon irrigation, occupy about 54 per cent. of the total cropped area; and of an average area of 14 million acres annually under crop in a year favourable for irrigation, 3 million are irrigated from wells, $1\frac{1}{4}$ million from tanks or natural depressions, and over $\frac{1}{2}$ million from other sources; making a total irrigated area of over $4\frac{1}{2}$ million acres, or more than one-third of the sown area. The area irrigated from tanks falls to about half a million acres in a year of severe drought, and of that area a large proportion is insufficiently watered. There are no Government works within this tract, with the conditions of a large portion of which we shall have to deal more in detail, when considering the question of introducing canal irrigation from the Sardah river.

470. *The Ganges-Jumna Doab.*—This tract comprises 13 districts, few of which are not now fully protected against famine by means of irrigation works. As will be evident from a glance at the map of the canal systems of the United Provinces which accompanies this report, almost the whole Doab is intersected by the numerous distributary channels of the Upper and Lower Ganges, and Eastern Jumna Canals; and in addition there are in most districts good facilities for well irrigation, more especially for *kachcha* or temporary wells, for the construction of which the subsoil is, in many parts of the Doab, peculiarly favourable. The average annual rainfall is about 30 inches, and the average winter rainfall about $4\frac{1}{4}$ inches in the north-west at Saharanpur, decreasing to 2 inches at Aligarh, and to $1\frac{1}{4}$ inches east of that station. Out of an average area of about $11\frac{1}{2}$ million acres which are annually sown, over 5 million acres, or nearly 45 per cent., are irrigated in a dry year; and of this roughly one-half is from Government canals, nearly one-half from wells, and a small balance from tanks and other sources. Before the introduction of canal irrigation, the districts composing this tract were among the most insecure in Northern India; and the construction of the Ganges Canal was largely due to the impressions produced by the sufferings of the famine of 1837, one of the most terrible in Indian history. Again in 1860-61 famine was severely felt in the upper portion of the Doab. Since then the country has been protected by irrigation, and although the droughts of 1868 and 1877 were severely felt, there has been no actual famine.

471. *The southern tract.*—The fourth, or southern tract differs entirely, in its geological formation and agricultural conditions, from the three tracts which lie on the northern slope of the Gangetic valley. Those tracts are alluvial formations consisting of layers of loam and sand of varying thicknesses, extending to an unknown depth. This lies for the most part on the rock formations of Central India, and even where its soils are alluvial they are generally of a different character from those on the north of the Jumna. It is naturally divided into two sections, the western section comprising the Bundelkhand districts of Jhansi, Hamirpur, Banda, and Jalaun; and the eastern section, those portions of Mirzapur, Benares, and Ghazipur, which lie south of the Ganges river.

472. Of all portions of the Provinces, Bundelkhand is most affected by the vicissitudes of the rainfall. The annual average is from 30 to 40 inches, but it ranges between the extremes of one-third and twice the normal, and, owing chiefly to the prevalence of black cotton soils, either excess or deficiency may lead to scarcity or famine. The districts of Bundelkhand suffered severely in the famines of 1837, 1869, and 1896-97, and, though with less severity, in 1873 and 1877. Their present condition is thus described by the Hon'ble Mr. Hooper

in his speech at a meeting of the Legislative Council of the United Provinces (19th January 1903) :—

The crops suffer in years of heavy or unseasonable rainfall as well as in drought, and agriculture is liable to a special form of injury in the spread of *kans*, a grass that periodically overruns the richest soils and renders them for the time uncultivable. The effects of great calamities, such as famine, are far more serious and lasting than in more stable tracts, and recovery is more slow. Bundelkhand is now beginning to recover from one of these disasters, the famine of 1896-97. In that year the cultivated areas were nearly a million acres below the maximum reached in 1882-83, which is a variation of nearly one-third (1882-83, 3,327,842 acres; 1896-97, 2,269,414 acres); and this is an example, though perhaps an extreme example, of the great fluctuations to which the cultivation is subject. In some of the years that followed, the seasons were not propitious and it is only recently that improvement has begun. The agricultural loss during a series of bad years has been enormous, and it fell upon a people already deeply involved.

473. The expenditure incurred by Government, including remissions of land revenue and of advances, during the famine of 1896-97 in the four districts of Bundelkhand amounted to over a crore of rupees. One-half of this sum was spent in the single district of Banda, of which at one time over 42 per cent. of the people were receiving relief.

474. The most productive soil in Bundelkhand is the variety of black cotton soil, which is locally known as *mar*. In this, *juar* and wheat are extensively grown, but the soil is so retentive of moisture, and the crops grown on it are so liable to be injured by any excess of moisture, that artificial watering is applied to it only when the rains fail, or as a preliminary to *rabi* sowings when the rainfall is seriously deficient in the later months of the monsoon. Another black soil, known as *kabar*, closely resembles *mar*, but it is of a stiffer consistency and in the *rabi* it is utilized more for the growth of gram and mixed crops than for wheat alone. Water is applied to it somewhat more freely than to *mar*, but in all ordinary years the rainfall of the monsoon provides it with sufficient moisture even for the *rabi* crops. A yellowish red loam called *parwa*, which is found extensively in many parts, is less suited than the black soil to dry crop cultivation, but with the aid of irrigation it produces excellent crops of wheat and barley. There is no question as to the benefits of irrigation in this and similar soils. The crops grown in them benefit by irrigation even in ordinary years, and without it they fail in years of scanty rainfall. The Bundela cultivator has the reputation of being apathetic and wanting in enterprise. He does not take readily to irrigation from wells, or even to the labour involved in lifting canal water a few feet on to his fields; but, where canal water can be flushed on to the yellow or red soils, he is ready to use it, and to pay for it; and even in black soil tracts, where the natural apathy of the cultivator is intensified by the ease with which a crop can be raised in a dry year, he is slowly learning to make the best use of the water which the Betwa Canal has placed at his disposal.

475. The second, or eastern, section of this southern tract does not appear to have been visited by actual famine until 1896, and then it suffered with much less severity than the least affected of the Bundelkhand districts. It is however said to suffer from scarcity or distress about once in 20 years. Black soils prevail in the southern portion of the alluvial plain which extends from the foot of the hills to the Ganges river. North of this portion there is a stretch of soil eminently suitable for irrigation and rice cultivation; and north of this again, is a strip of good alluvial soil which is flooded yearly by the Ganges, and grows excellent crops without irrigation.

476. *Utility of irrigation.*—With regard to the value of irrigation in increasing the produce of land in the United Provinces, it may be said that the millets and pulses, which form the staple *kharif* crops of the western districts and which are largely grown in almost all parts of the province, would derive no benefit from irrigation except in an unusually dry year; rice, the principal crop of the sub-montane and central tracts, yields under irrigation an increased outturn of about 20 per cent. in the former, and 40 per cent. in the latter tract; the valuable sugar-cane and poppy crops are, in all years, dependent upon irrigation, as is indigo, the growth of which leads to an increased outturn of the subsequent *rabi* crop. Under irrigation, also, cotton can be grown to a sufficient height to enable it to escape injury from the first heavy burst of the monsoon. Of the staple *rabi* crops, gram does not require any artificial watering in ordinary years; but in the case of wheat and barley irrigation increases the

outturn by 50 to 100 per cent. As to the protective value of irrigation, it may safely be said that, excepting the hill districts and a portion of the sub-montane tract, there is no part of the United Provinces which can be considered even fairly secure, unless at least one-third of its cultivated area is protected by irrigation from a source which will not fail in a year of drought.

(ii).—*Existing State irrigation works.*

477. *Number and classification of State irrigation works.*—In the United Provinces the State irrigation works under the control of the Irrigation Department comprise five large and eleven smaller canals, and twelve small storage works. The canals are all of the perennial as opposed to the inundation type; that is, their supplies are taken in by means of permanent, or in some cases temporary, dams constructed across the rivers from which they are drawn. Of the five large canals, four, the Upper and Lower Ganges, Agra, and Eastern Jumna, are classed as productive; and one, the Betwa Canal, as protective. The remaining works are all classed as minor works, and for convenience of administration and accounts they are grouped into separate systems known respectively as the Dun, Bijnor, and Rohilkhand Canals, and the Jhansi and Hamirpur Lakes; the names of the latter indicating the districts in which the storage works are situated. To this list of Government works should also be added the numerous small canals which have been constructed in the Government estates of the Naini Tal district, and which are known collectively as the Tarai and Bhabar Canals. These works are managed by an Engineer of the Irrigation Department whose services have been lent to the Estates, but the expenditure on them is not shown in the departmental accounts.

478. *Total cost of the works and general financial results.*—Up to the 31st March 1901 the capital expenditure which had been incurred on all works under the charge of the Public Works Department amounted to 907 lakhs. Taking the mean of the results for the preceding six years, so as to include both wet, dry, and normal years, the annual revenue derived from the works which were in operation at the commencement of the period amounts on an average to 88½ lakhs, the working expenses to 29½ lakhs, and the net revenue to 59 lakhs, representing a return of 6·9 per cent. on the capital cost of the works, which may be put at 853 lakhs. Taken as a whole, therefore, the works yield a substantial profit to the State.

479. *General protective results.*—In a year of average rainfall the works irrigate about 2½ million acres, but the area varies greatly from year to year according to the nature of the seasons. In 1894-95 with a good monsoon followed by good winter rains, the total area barely exceeded a million acres. On the other hand, in 1896-97, when over the whole canal tract there was practically no rain after the end of August, the area rose to well over 3 million acres. In that year the real protective value of the works was fully demonstrated. Under conditions very similar to those which led to such widespread famine or distress throughout the greater part of the Provinces, the cultivators in the canal-irrigated tracts not only secured their crops, but, owing to the high prices prevailing, they were exceptionally prosperous. As soon as their spring crop was assured, they were able to export grain, and thus out of their plenty to contribute to the wants of less fortunate tracts. The value of the crops raised by the works in that year was estimated at 13 crores of rupees, a sum which exceeded by 50 per cent. their total capital cost, while one and a half million tons of edible produce were rendered available as food for the people. But perhaps the best testimony to the protective value of the canals is afforded by the following extract from Sir Antony MacDonnell's review of the Chief Engineer's report for the year. Referring to the financial results of the year's operations the Lieutenant-Governor wrote:—

These very satisfactory figures show the results of the year's operations as gauged by the departmental system of accounts; but, taken alone, they fail to represent the true value of the canals during a year of drought. In a year such as that through which we have just passed it is in the effective protection against famine and scarcity afforded to almost the whole of the canal irrigated tract, in the suitable employment provided for some millions of the people, in the exceptional prosperity of large numbers of the cultivating classes, and in the land revenue secured to Government, that the most important and most beneficial results of the canals are to be found. In these respects the benefits derived from the canal works during the past year of drought can hardly be exaggerated.

480. *Injurious effect of canal irrigation, and the* ever be said that the canals in the United Provinces have an unmixed benefit. upon every tract which they command. In many places introduction led to a gradual but steady rise in the level of the subsoil water, and resulted eventually in water-logging of the soil, the increase of malaria, and the further deterioration of *usar* or *reh* covered tracts. To remedy these evils and to prevent further injury, it was found necessary to incur a considerable outlay on the re-alignment of some of the older channels, and on the construction of a large system of drainage channels, the aggregate length of which now amounts to 3,327 miles, or to more than one-third of the total length of the canals and their tributary channels. On the construction of the drains an expenditure of about 48 lakhs has been incurred. These measures have gone far to remedy, if they have not entirely removed, the evils of which there were such serious complaints in past years.

481. *Dependence placed upon the winter rainfall.*—The canals have all been designed with carrying capacities largely in excess of the supplies in the river during the later months of the cold weather. Thus, if the later monsoon rains fail, the large supplies carried by the canals irrigate an area in excess of that to which the full number of waterings can be given if the winter rains also fail. We have had objections raised to this system, but there can be no question that it ensures protection to the widest possible area. It enables a larger area to be sown with *rabi* crops than would be possible without aid from canals, and if the usual winter rains fall the whole area is matured. If they fail, a full crop cannot be ensured over the whole area; but a much larger area will yield a full or substantial crop than would be the case if the supply were limited in the first instance to the area to which water could be guaranteed towards the end of the season; and with the high prices of produce which usually prevail when there is a failure of the winter rains, the cultivators can have no cause for complaint, provided that remissions of water-rate are given as liberally as the rules provide, on the small number of fields which fail to yield a fair crop.

482. *Increase in the protection afforded by State works.*—The area irrigated fluctuates with the rainfall to such an extent that figures based upon averages do not afford a good indication of the gradual growth of the protection afforded by means of Government works. Of dry years even, no two years are alike, and a year in which there is a steady and continuous demand, taxing the canals to their utmost throughout the whole of both irrigating seasons, is unknown in these provinces. In 1877 a good fall of rain in December put a stop to all demand for water, and in 1896 the rainfall up to the end of August was normal or in excess of the normal. But taking the areas irrigated during those two famine years as a measure of the then irrigating and protective capacities of the works, we find that during the past twenty-five years the area has been more than doubled, having risen from under 1½ million to over 3 million acres.

LARGE CANAL SYSTEMS.

483. *The four productive works.*—The following tabular statement shows the financial results of the four large canals of the productive class, based on an average of the six years ending 1900-01. The figures given for the Lower Ganges Canal do not include those for the recently opened Fatehpur Branch.

| Name of Canal. | Canal opened in | AVERAGE OF 6 YEARS 1895-96 TO 1900-01. | | | | Area irrigated. | Excess of net revenue over interest charges to end of 1900-01. |
|---------------------|-----------------|--|---------------|---|---------------------------------------|-----------------|--|
| | | Total capital outlay to end of year. | Rs. | Excess of annual net revenue over interest charges. | Percentage of net revenue on capital. | | |
| Upper Ganges Canal | Year. 1854 | 2,98,87,861 | Rs. 17,05,245 | 91,084 | 9.47 | 948,977 | Rs. 1,27,58,890 |
| Lower Ganges Canal | 1878 | 3,53,24,044 | 1,80,500 | 8,82,186 | 3.97 | 774,137 | —26,21,950 |
| Agra Canal | 1874 | 95,40,173 | 28,59,015 | 28,59,015 | 5.60 | 228,739 | —14,09,353 |
| Eastern Jumna Canal | 1850 | 33,64,233 | 7,86,16,311 | 7,86,16,311 | 26.55 | 285,987 | 2,20,32,711 |
| TOTAL | ... | ... | ... | ... | ... | 2,237,840 | 3,08,20,398 |

These results may be regarded as fairly normal for all and each of the works. The canals irrigate on an average about $2\frac{1}{4}$ million acres, or $22\frac{1}{4}$ per cent. of the gross area of 10 million acres which they command. They yield an annual net revenue of about 58 lakhs, equivalent to a return of 7.37 per cent. on their capital cost; and after meeting interest charges which amount to Rs. 29,32,375 there is left a clear profit to the State of Rs. 28,59,015 per annum. The extraordinarily high percentage earned by the Eastern Jumna, as compared with the three other canals, is due partly to the inexpensive nature of the works, more especially of the head-works, and partly to the fact that sugar-cane and rice, which pay the maximum water-rate, form 38 per cent. of the total area of crops irrigated by the canal. On the Lower Ganges Canal, on the other hand, the capital cost has been swollen by heavy expenditure incurred on the construction of the head-works and of a large aqueduct on the Kali Nadi, while less than 9 per cent. of the crops consists of sugar-cane and rice. The net revenues earned by all four canals, from the dates of their opening up to the 31st March 1901, are 308 lakhs in excess of the interest charges to the same date. On the Eastern Jumna Canal the deficit was not cleared off until 33 years, and on the Upper Ganges Canal until 38 years from the date of opening. There are still balances of 26 lakhs against the Lower Ganges Canal, and 14 lakhs against the Agra Canal, but these are now annually diminishing.

484. *Capital cost per acre.*—Calculating on the average area irrigated, the capital cost of the four productive works amounts to Rs. 35 per acre. This is much higher than the corresponding figure for the Punjab, where, as we have shown, it amounts to only Rs. 21.1 per acre. The high rate in the United Provinces, compared with the Punjab, is due chiefly to the greater average rainfall, to the consequent less steady demand for canal water, and to the fact that in the United Provinces, where canal water is in general required merely to supplement the rainfall, the supply of water is distributed, and the protection which it affords extended, over relatively a much wider area than in the Punjab. In the latter province not only is the supply available for the canals larger in proportion to the area commanded, but there are also large tracts in which, owing to the scanty rainfall, cultivation without irrigation is impossible. Thus, with less contraction of the irrigated area in years of good rainfall, there has not been the same necessity for, or incentive to, a very wide distribution of the supply. The difference is also in part accounted for by the relatively larger expenditure incurred in the United Provinces on works connected with navigation, on escape channels rendered necessary by the more fitful nature of the demand, and on drainage works required to carry off the more abundant rainfall.

485. *Revenue, maintenance charges, and value of crops irrigated.*—The gross revenue annually earned by the four canals, including the share of the land revenue which is credited to them, amounts to over 84 $\frac{3}{4}$ lakhs, or to Rs. 3.80 per acre. The working expenses average Re. 1.20 per acre, or, with interest added, Rs. 2.59 per acre, leaving Re. 1.21 per acre as clear profit to Government. The value of the crops irrigated in an average year is estimated at 800 lakhs, or rather more than the total cost of the canals.

486. *Results of expenditure on improvements.*—In discussing the growth of irrigation on the perennial canals of the Punjab, we have called attention to the remarkable expansion of irrigation which has taken place during the past ten years, owing mainly to the adoption of measures for extending irrigation up to the extreme limits imposed by the supply of water available, or by the physical features of the country, and for ensuring a more economical use of the water. The policy of extending irrigation up to the farthest limits of the Doab was carried into practical effect in the United Provinces many years ago, and, with one important exception at the tail of the Ganges-Jumna Doab, all the large branch canals required to carry water along the watersheds of the main drainage lines, were completed before 1880. There were no doubt large tracts within command of the canals to which water had not been taken; but, with the one exception which we have noted and to which we shall again refer, these were all areas from which canal water had been purposely excluded owing to the unsuitability of the soil, or to the existing facilities for irrigation from wells and other sources. There has been, therefore, of recent years practically no scope for the expansion of irrigation, except by extending and improving the systems of small

distributary channels, and by economizing water so as to ensure its distribution over the widest possible area. The measures, with this end in view, which have been introduced independently on the canals of the United Provinces, are very similar to those adopted in the Punjab (paragraph 16); but, in addition, the bed slopes of many of the distributary channels have been reduced with the object of causing a deposit of fine silt on the bed and side slopes, and of thus reducing loss by percolation. As in the Punjab, these measures have been greatly facilitated by the rules introduced in 1890, which rendered it more easy to obtain funds for works of extension and improvement than it had been before the construction estimates of the works were closed, and also by the liberal grants for minor improvements which have been charged against the revenue account of the canal. In the case of the four canals which we are now considering the estimates were closed on the 31st March 1891. Taking, as we did in the case of the Punjab canals, the aggregate of the maximum areas irrigated before 1894-95, as representing the irrigating capacity of the works when the estimates were closed, and the aggregate of the subsequent maximum areas as their present capacity, we find that there has been an increase of 744,613 acres. Since 1891 an expenditure of 57½ lakhs has been incurred against capital, and of 21 lakhs against revenue for works of extension and improvement, making a total of 78½ lakhs, or an average of Rs. 11 per acre of extension, most of which is due to this expenditure. This result agrees very closely with the corresponding rate for the Punjab, and affords further evidence of the profits to be derived from a liberal expenditure of funds in developing irrigation on works which have been nominally completed.

487. *The Fatehpur Branch Extension.*—For the area at the extremity of the Doab, referred to in the preceding paragraph as being still outside the canal irrigated tract, it was for some years doubted if a sufficient supply of water would be available. The early results of the measures for economizing water which were adopted extensively after 1891, showed, however, that there need be no serious apprehension on this point; and, with a view to extending canal irrigation into this tract, the construction of the Fatehpur Branch of the Lower Ganges Canal was commenced in 1895. The works have now been practically completed at an outlay of 34 lakhs. The branch was opened for irrigation in 1898, and in 1901-02 it irrigated 34,451 acres. When irrigation is fully developed it is expected to irrigate annually 120,000 acres, or about one-fifth of the cultivable area commanded.

488. *Other extensions.*—There are only two other works of individual importance remaining to complete the main distributing systems of the Ganges Canals. These are the extensions, which are now in hand, of the existing Mat Branch and Kalda distributary, to irrigate 83,000 acres in the northern part of Muttra and in the Aligarh district, at an estimated cost of 11 lakhs. On the Agra Canal the Nandgaon distributary is being extended to irrigate 46,000 acres in the northern half of the Muttra district at a cost of 2½ lakhs.

489. *The Betwa Canal.*—This is the only work in the United Provinces of the 'protective' class. It was constructed at a cost of 42 lakhs for the protection of the Jalaun district. It also irrigates small tracts in the Jhansi and Hamirpur districts, and in a few Native States, but the total area irrigated in these tracts does not ordinarily exceed a thousand acres. The canal receives its supply from the Betwa river which rises in Bhopal, on the northern slopes of the Vindhyan range. The river is dammed up by a masonry weir, about a mile in length from end to end, and with its crest level 50 feet above the lowest point in the river-bed. The area drained by the river above the dam is so large (10,000 square miles), and the rainfall in the upper reaches of the catchment so assured, that during the monsoon months there is always an ample supply. The flood discharge may rise to about ¾ million cusecs; but on the cessation of the monsoon the volume rapidly falls, and in a dry year, before the end of December, it dwindles to a few cusecs. The dam, on the crest of which iron shutters 6 feet high have recently been erected, forms a reservoir 16 miles long with an average width of about ¼ mile. It stores 2,750 million cubic feet of water with which the canal's supply is supplemented when the discharge in the river falls

below requirements. The narrow width of the channel above the dam, and the high velocity of the floods, prevent any perceptible deposit of silt in the reservoir. The canal was designed to take in 1,000, but is capable of carrying 1,200 cusecs. It was estimated to irrigate 120,000 acres in a year of full demand for water, and to yield an average return of 1·69 per cent. on the capital cost.

490. A mean of the financial results for the six years ending with 1900-01 may be taken as fairly typical of the average returns now derived from the canal. It shows that the average gross annual revenue of Rs. 85,000 falls short of the maintenance charges by Rs. 17,000; including interest charge there is an annual loss from the canal of Rs. 1,81,000. Expressed in acreage rates, the working expenses and interest charges amounted to Rs. 5·68 per acre irrigated, and the gross revenue to Rs. 1·81, leaving a net annual loss of Rs. 3·87 on a capital expenditure of Rs. 93 per acre. Calculated on the area protected against drought in the famine year of 1896-97, the capital expenditure is Rs. 50, and the net annual loss Rs. 3 per acre.

491. The canal was opened in 1885, and in the fourth year from its opening the irrigated area rose to over 32,000 acres. That area was seldom, and only by a small amount, exceeded until the famine year of 1896-97, when 87,306 acres were recorded. In years of ordinary rainfall the irrigated area still falls short of 40,000 acres. The work, it will be seen, has not fulfilled, either in its financial or protective effects, the expectations that were formed when the estimates were framed; but, though the protection afforded to the Jalaun district during the famine was incomplete, the canal led to sufficient reduction of distress, and of expenditure on relief, to justify its construction. In the words of Sir Antony MacDonnell, it was the salvation of the Jalaun district.

492. *Difference in the results in the two branches of the Betwa Canal.*—It is instructive to notice that the financial results shown in paragraph 490 are the mean of those obtained by two separate branches—one, the Kathaund Branch, running through a country in which *parca* or yellow soil predominates; and the other, the Hamirpur Branch, commanding a tract consisting almost entirely of black cotton soil. Taking the average results of the past five years, during which the conditions have been on the whole more than ordinarily favourable to the irrigation of black cotton soil, we find that the Kathaund Branch has irrigated annually 33,000 acres, returning a gross revenue of Rs. 2 per acre; while the Hamirpur, which is the larger of the two, has irrigated on the average only 16,500 acres, returning a gross revenue of Rs. 1·5 per acre. The net annual loss to the State, assuming the capital cost and working expenses to be divided equally between the two branches, comes to Rs. 6½ per acre for the Hamirpur, against Rs. 2 per acre for the Kathaund Branch. The former figure affords a good indication of the probable cost of providing irrigation, by a canal like the Betwa, in the purely black cotton soil tracts of the United Provinces, where rice and perennial crops are not grown, or are grown only on an insignificant area.

MINOR WORKS.

493. *Small Canals.*—The three systems of minor canals all irrigate in the sub-montane tract, and are fed by streams which rise in or near the lowest ranges of the Himalayas. Two of them, the Dun and Bijnor Canals, are highly remunerative works, returning $7\frac{3}{4}$ and $12\frac{3}{4}$ per cent. respectively on their capital cost. The Rohilkhand Canals, which command a country generally less fertile and requiring less artificial irrigation, return about 4 per cent. now that the water-rates have lately been increased. Collectively the small canals yield a net revenue of over $1\frac{1}{2}$ lakhs, or $5\frac{1}{2}$ per cent. on a capital outlay of 27 lakhs. On an average they irrigate 140,000 acres annually. In the famine of 1896-97 by their aid the crops on 163,000 acres were brought to maturity, against 64,000 acres in the famine of 1877-78. This large increase is to be attributed chiefly to liberal expenditure on improvements during the past 15 years.

494. *Storage works.*—The twelve tanks in the Jhansi and Hamirpur districts are the only works in the Provinces under the charge of the Public Works Department which are entirely dependent upon storage. They are all old works which were in existence before the district came under British Government, and appear to have been made more for ornament than for use. About Rs. 80,000 have been spent on improvements which have about doubled the irrigated area, but even now they only irrigate from three to five thousand acres annually. The revenue, in the shape of water rate and enhanced land revenue, barely suffices to cover the annual working expenses.

495. *The Tarai and Bhabar Canals.*—In this system are comprised about 20 small canals which have been constructed in the Government estates in the Naini Tal district, chiefly with the object of opening out jungle tracts to cultivation. They irrigate annually 125,000 acres consisting mainly of rice. There are no separate accounts showing the cost of the works and the revenue derived from them.

(iii).—*Scope for further extensions of State irrigation works.*

496. *The sub-montane tract.*—No proposals have been laid before us for the construction of new works in the sub-montane tract. In the western districts of Dehra Dun, Bijnor, and Bareilly, all the available water-supplies of any consequence are said to be already fully utilized. East of the Naini Tal Tarai there are no Government irrigation works, and there is said to be but little scope for their construction; but the question of utilizing hill streams for the protection of the rice areas, and for the general extension of irrigation in these more eastern districts should, we consider, be investigated as soon as the services of a qualified officer can be spared for the purpose.

497. *The central tract.*—Three works have been proposed for the irrigation of this tract: the Eastern Ganges, the Ramganga Canal, and the Sardah Canal.

498. *The Eastern Ganges and Ramganga Canals.*—Projects for both of these works were prepared more than thirty years ago for the irrigation of the tract lying between the Ganges and Ramganga rivers, in the districts of Bijnor, Moradabad, and Budaon. The high level of the subsoil water in the tract to be irrigated, the contention that water would be but seldom required for the *rabi* and still more seldom for the *kharif* crops, the consequent improbability of securing any adequate return on the required expenditure, and the facility with which temporary wells can be constructed, led to the abandonment of both schemes. Moreover the Ramganga, though it carries an enormous volume when the river is in flood, runs practically dry soon after the rainy season; and, with the existing canals on the right bank utilizing all the available cold weather supply of the Ganges, there is at present no surplus available for the supply of a canal taking off from the left or eastern bank of that river. It may be quite impossible to procure a perennial supply for the irrigation of this tract, and even if a supply could be procured, one or other of the obstacles owing to which the previous projects were condemned, may prove insuperable; but we do not think that the possibility of affording future protection to the tract by means of canal irrigation should be finally abandoned on the basis of information collected over thirty years ago. In spite of the high spring level in certain parts, and of the insufficiency of the protection afforded by the existing means of irrigation, distress from the failure of the rainfall appears to be as frequent in Rohilkhand as in any part of the Provinces. It is no doubt as a rule less intense, but in the district of Budaon the rainfall has been seriously deficient in no less than ten years out of the fifty-two for which records are available, and at least three of those years were years of famine, and two of more or less severe distress. In Moradabad only 19·17 per cent., and in Budaon only 24·4 per cent. of the normal cropped area is at present protected by irrigation.

499. We recommend, therefore, that the question of introducing canal irrigation into these districts should again be examined and considered.

detailed information that can now be collected with regard to the requirements and conditions of every village in the tract. It seems most unlikely that a canal from the Ramganga would afford a sufficient supply for the *rabi* season, and it would probably be too costly to construct. But it may be possible to provide a fair amount of protection at a reasonable cost by means of a *kharif* or inundation canal taking off from the left bank of the Ganges above or near the head-works of the Ganges Canal. Such a canal would at least afford a supply for a considerable area of rice and other *kharif* crops, and for the sowing of the *rabi* crop should the later rains fail. Eventually, when every possible means have been adopted for economizing water on the Ganges and Eastern Jumna Canal, or if any of the Sardah water can be carried into the Ganges—a proposal to which we shall presently refer—it may be found possible to divert some of the cold weather supply of the Jumna river for the irrigation of *rabi* and perennial crops in parts of these districts where the spring level is not prohibitively high.

500. *The Sardah Canal.*—There is probably no scheme for the introduction of canal irrigation into any part of India which has formed the subject of so much discussion as that for a canal from the Sardah river for the irrigation of Oudh. Nor has any more difficult problem been laid before us during the course of our inquiries than that of deciding whether the numerous objections which have been raised against the scheme are sufficient to prevent the utilization, in the Ganges-Gogra Doab, of the enormous volume of water which now runs to waste in the Sardah river.

501. The first project for a canal from the Sardah was prepared by Captain Forbes, R.E., in 1870, and provided for the irrigation of 2,380,000 acres in the country lying between the Gogra and Ganges rivers, at an estimated cost of over 6 crores of rupees, inclusive of outlay on navigation works. It was however foreseen that water might not be required for the whole tract, and in 1871 Captain Forbes prepared a revised scheme restricting irrigation to the north-west of a line passing through Lucknow and Fyzabad. This modified project was estimated to irrigate 600,000 acres, and to cost 3 crores. It was however held in abeyance for some years owing to the opposition of the principal landowners. In the Report of the Famine Commission of 1878 the scheme was referred to as one which "ought not to be any longer rejected unless grave and substantial objections to it can be established."

502. In the following year, 1879, Major Forbes drew up yet another modified scheme for irrigating the districts of Kheri, Sitapur, Hardoi, Lucknow, Barabanki, and Fyzabad, with possible extensions to Azamgarh and Jaunpur. The opinions recorded by the District Officers upon this scheme were generally unfavourable to the construction of the canal; and Sir George Couper, who was then and had been for many years Chief Commissioner of Oudh, stated his unwillingness to proceed with the elaboration of the scheme until driven to do so by the necessity of putting it in hand as a famine relief work. He assigned as his reasons: the degree of protection already afforded by existing means of irrigation; the possibility of their further development; and the injurious effect of the canals in the Ganges-Jumna Doab on the health of the people. In the following year, after a deficient *kharif* harvest, Colonel Brownlow, Chief Engineer for irrigation, having regard to the low supply in the wells and to the emptiness of the *jhils* and tanks in Oudh, recommended the completion of the surveys and the preparation of a project for a canal to command the Gogra-Gumti Doab. Sir George Couper accepted the recommendation with evident reluctance, in view of the necessity of providing relief labour in the event of a failure of the winter rains. The project which was subsequently prepared by Captain Clibborn and Mr. (now Sir William) Garstin provided for the irrigation of 720,000 acres, or about one-fourth of the unirrigated and cultivable area of the Gogra-Gumti Doab. The canal was designed to carry 3,800 cusecs, and was estimated to yield a return of $6\frac{1}{4}$ per cent. on a capital outlay of about $3\frac{1}{2}$ crores. This project seems to have been held in abeyance mainly from financial considerations, the Local Government being unwilling to guarantee interest on the expenditure, though evidently desirous of seeing the canal constructed for the protection of the country.

503. The matter is again referred to in the following terms in the Resolution of the Local Government on the administration of famine relief in 1896-97:—

In October last the failure of the crops threatened to be greater in Oudh than elsewhere, and the question of undertaking the Sardah Canal as a relief work came again under discussion. The magnitude of the work, however, was so great, while the injury to the country, if a mistake were made, would be so far-reaching, that the Lieutenant-Governor decided not to enter on this great undertaking as a famine relief work without careful preliminary inquiry. But in view of the possibility that the famine might continue for longer than a year, Sir Antony MacDonnell considered it desirable to come to some decision on the question whether a canal could be advantageously made or not. Accordingly Mr. King, Superintending Engineer, was deputed to inquire into the merits of the project, and he spent four months of the cold weather in doing so. Mr. King's report has not yet been finally considered; but it may here be said that, in his opinion, Sitapur, Hardoi, Lucknow, and Barabanki are the only districts of Oudh into which canal irrigation could be profitably introduced. The facts to be deduced from Mr. King's report are, on the one hand, that the water-supply from the proposed canal would be for these four districts practically unlimited, that a canal could be made for about $4\frac{1}{2}$ crores, which would possibly return 5 per cent. on the outlay,* and that these districts would be protected from the effects of drought, their wealth greatly increased, and about 265 square miles of shallow tanks reclaimed for *rabi* cultivation.

On the other hand, the report shows that there are serious though probably not insuperable difficulties attaching to the project, arising from the high spring level of the subsoil water, and the nature of the subsoil and drainage. The construction of the canal continues to be viewed with disfavour by a large though a decreased proportion of landowners and cultivators, and there is some doubt whether adequate water-rates could be realized.

The matter is still under the Lieutenant-Governor's consideration: but the facts which have been established by Mr. King's inquiries show the prudence of the decision which rejected the work as a famine relief measure.

Subsequently in May 1899, the Lieutenant-Governor, when forwarding Mr. King's report to the Government of India, wrote as follows:—

On a review of the case Sir Antony MacDonnell considers that the canal is not required as a famine protective work, while he is satisfied that its construction would so raise the water-level, already high, of the tracts through which it would pass as to produce the most injurious consequences to the agriculture of the tracts and to the health of the inhabitants. The opposition of the landowners, though it may have been justified by unsubstantial reasons, had thus a solid foundation on which to rest. The opposition is as strong to-day as it was in Colonel Forbes' time; although some few Taluqdars wavered in 1897 in their opposition, the great body are united in opposing the construction of the canal.

The Lieutenant-Governor does not think that interest on its capital could possibly be recovered consistently with moderate assessments of water-rates and popular contentment.

The Lieutenant-Governor and Chief Commissioner is therefore unwilling to support the scheme, which should, in his judgment, be finally abandoned while the physical conditions and popular feeling remain as they are.

504. From this brief history of the project it is evident that the Local Administration has never at any time been so fully convinced of the necessity for the work as to press very strongly for its construction. In fact, on two of the three occasions on which the construction of the canal was seriously considered, the proposal was condemned by the responsible local authorities; and, in both these cases, there had recently been ample opportunity for noting the possible effects of drought in the tract concerned. In each case, however, the condemnation was accompanied with a reservation. Sir George Couper admitted the possible necessity of carrying out the project as a famine relief work. Sir Antony MacDonnell recommended that the scheme be abandoned "while the physical conditions and popular feeling remain as they are now." The immediate question for our consideration is, whether there is sufficient evidence to justify us in recommending the final abandonment of all proposals for constructing a canal from the Sardah for the irrigation of the whole or any portion of the large tract that could be commanded by it.

505. The objections which have been raised against the introduction of canal irrigation into the Ganges-Gogra Doab are that the canal is not needed as a protective work, the country being already fairly well protected by its rainfall, by the existing means of irrigation, and by the facilities for their extension; that it would cause serious injury by raising the water-level; and that it would not be

If the conditions of the subsoil water-level, and the nature of the soil and subsoil as stated by Mr. King, are general, the injury that might be caused by the introduction of canal irrigation on any extensive scale is unquestionable. It could no doubt be mitigated, and even to a very large extent be prevented, by drainage, by rendering the channels water-tight, by limiting irrigation to a small percentage of the area commanded, and, if necessary, by closing certain channels throughout the *rabi* season; but these measures might raise the cost of the work to a prohibitive figure compared with the area to be irrigated. The records which have been laid before us are not, however, in our opinion, sufficiently detailed to justify the final abandonment of the scheme on the ground of danger from water-logging.

511. These records show that along the alignment proposed for the main channels the depth to water-level varies from a minimum of 11 feet in Hardoi to a maximum of 33 feet in Lucknow; and that in certain parts of some districts pure sand is found at a depth of 6 to 12 feet below the surface of the ground. But much more detailed information than this will be necessary before it can be said that the conditions with regard to water-level and subsoil offer insuperable obstacles to the construction of a canal. The areas must first be demarcated into which it seems desirable to carry canal water, having regard solely to their irrigational needs, the extent to which they must depend upon canal water for their protection, and the suitability of their soils for canal irrigation; the subsoil water-level within these areas, and outside them up to the limits of their main drainage outfalls, and the depth of overlying loam, must be observed and shown on a plan or cross sections of the country; and all matters bearing on the necessity for and possibility of completely draining the tract likely to be influenced by the canal, must be thoroughly investigated before any decision will be possible on this important question. The projects for the canal contain a good deal of general information on these points; but, though complete in all engineering details, they were prepared at a time when the necessity for very detailed observations of the kind which we have noticed had not yet been fully realized.

512. A survey party is now engaged in investigating the possibility of taking out a canal from a point high up on the Sardah river, for the protection of the Hardoi district by affording a supply of water to fill the natural depressions in years of short rainfall. It will, no doubt, collect all the information that is necessary for the immediate object in view; but we would recommend that the investigations be extended so as to include all the detailed information necessary for the purpose of deciding on the practicability of constructing a canal for direct irrigation in Hardoi, and in those portions of Lucknow and Barabanki which lie south of the Gumti river. It may also be found desirable to include portions of Shahjahanpur, Unao, and perhaps Rai Bareilly, within the scope of the investigation. The proposal to construct a canal to replenish the natural tanks in Hardoi is a very recent one, and the investigations relating to it have only lately been put in hand. We are therefore unable to form any opinion regarding it. But we see no reason for limiting the scope of the scheme in the manner proposed, until such detailed information has been collected as may justify the final rejection of all idea of affording really efficient protection to the most insecure tract in Oudh by means of direct canal irrigation. Although a canal for the irrigation of this comparatively small tract would probably not be fully remunerative, its protective value would be great; and it would afford a practical means of ascertaining the actual productive value of canal water, under the agricultural conditions and revenue systems of Oudh. We therefore recommend that a detailed project should be prepared with full provision for the prevention of water-logging, and that the question of carrying canal irrigation into these districts should again be considered.

513. The eastern districts stand less in need of protection. But, as we have shown, there is a limit to the protection which wells will afford to these tank-irrigating and rice-growing districts; and a time may come when increased pressure of population will render it imperative to provide some more effective form of protection.

514. With regard to the alleged opposition of the people to the Sardah canal scheme, we can only say that the opposition of the Taluqdars is apparently as strong as ever it has been; and that it is to some extent based upon exaggerated views regarding the effects of canal irrigation in causing an extension of *reh* efflorescence and in water-logging the soil in the Ganges-Jumna Doab. The injury formerly caused by water-logging in certain districts of that Doab was undoubtedly serious. But we have it on reliable evidence that the cultivators' complaints as to the extension of *reh* efflorescence were much exaggerated; and that the system of drainage, which was not introduced until many years after the older canals had been constructed, has put an end to all complaints of extensive water-logging. These drains, it may be noted, carry away water from many *jhils*, or natural depressions, which were in former days used for irrigation; and yet they appear to have been generally welcomed by the people, who preferred assured 'flow' irrigation from canals to the precarious and more difficult 'lift' irrigation from *jhils*. Nor have we reason to think that drains carrying off the water of natural depressions would, if judiciously designed, have any appreciable effect in increasing the magnitude of the floods; on the contrary, if they kept the depressions dry in the intervals of rainfall, they would render them more effective in storing surface drainage and preventing its too rapid flow to the rivers.

515. We cannot say to what degree the feelings of the Taluqdars against the construction of a canal are shared by the cultivators; but in the face of the evidence laid before us at Lucknow, and of the strong opinions expressed by the district officers, we cannot at present recommend the introduction of canal irrigation into Oudh outside the districts mentioned in paragraph 512. Having said so much, we must add that we are not convinced that there are really any grave and conclusive objections to the introduction of canal irrigation into other parts of Oudh. Many of the objections which have been laid before us might have been applied with equal force to more than one large tract where canals have, as a matter of fact, proved of great benefit to the people.

516. Nevertheless we do not think that it would be a wise policy to introduce canal irrigation wholesale into this large tract, even if the more detailed inquiries which we consider necessary should show that the drainage difficulty can be surmounted at a reasonable cost. There are many other reasons which render it desirable to proceed tentatively, or as tentatively as may be possible in dealing with a large river from which a supply can be drawn, and delivered where it is required, only at a considerable outlay. But there is one consideration which, in our opinion, is of itself sufficient to justify this course. Hardoi and portions of the adjoining districts stand far more urgently in need of protection than the remainder of the tract; and we cannot recommend that the measures necessary for their protection should be postponed until the general question of protecting the whole tract by carrying out the main Sardah Canal scheme has been investigated and settled, until all local prejudices have been overcome, and until all protective works which are considered more urgent than this general scheme have been completed. Whatever the results of the investigation may be, that scheme, as a whole, must take a much lower place in the order of urgency of protective works than can be assigned to any fairly promising scheme for the protection of Hardoi and the adjoining districts.

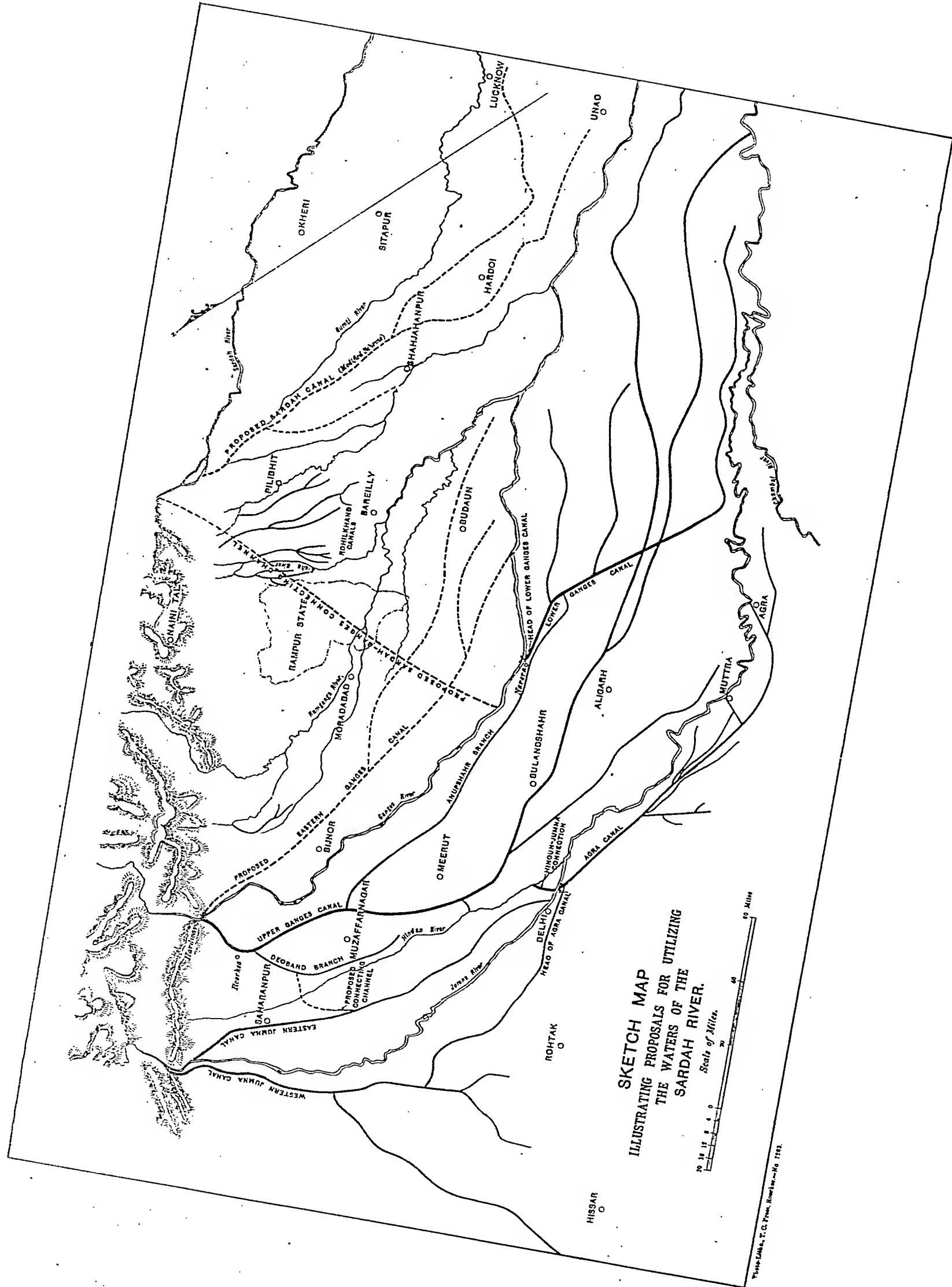
517. *Extensions of existing works in Ganges-Jumna Doab.*—The supplies available from the Ganges and Jumna rivers for the irrigation of this Doab are, as we have already stated, barely sufficient for existing works and for the extensions which are now under construction; and into every large tract of the Doab where canal irrigation is required it has been or is in process of being introduced. There is still scope for a number of small extensions, which would in the aggregate require a considerable volume; but, in the absence of any other source of supply, these can only be rendered possible by improvements in the methods of distribution and by other measures for economizing water. On the Eastern Jumna Canal especially, there appear to be some small tracts which are not now commanded by any distributary channel and in which the subsoil water is said to lie at a great depth. These tracts will, no doubt, receive attention when the necessary supply of water is found to be available.

518. *Storage works and prevention of percolation.*—The remarks which we have made in the Punjab Chapter (paragraphs 49 and 50) regarding storage works and measures for the prevention of percolation from canal channels, may be held as applying generally to the canals of the United Provinces. Observations on the lines recommended for the Punjab, should be made for the purpose of determining the loss by percolation from channels of all sizes; and, subsequently, money should be freely allotted with the object of ascertaining the best means of rendering the channels water-tight, and the volume of water that can be saved thereby. The effect on the spring level in the adjoining tracts should also be carefully noted. It is perhaps unnecessary for us to draw attention to the additional value which such observations and experiments will have in the United Provinces, in connection with the objections raised against the proposed Sardah Canal.

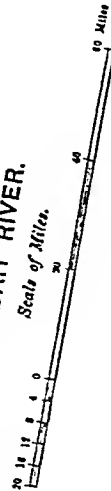
519. Unless, however, these and other measures for economizing water yield better results than seem to be anticipated by the canal officers, there will be but little water available for developing irrigation in villages which are now insufficiently irrigated, or for extending irrigation into other villages at the tails of the distributary channels, when the Fatchpur Branch and the extensions now under construction on the Agra and Ganges Canals have been given their full share of water. Even without any further extensions than are now in progress, the Doab is no doubt generally protected against serious or widespread distress; but if a serious failure of the monsoon were followed by a very scanty winter rainfall, the supplies likely to be available in the canals late in the *rabi* season would be quite insufficient to ensure anything like a full outturn from the large area of *rabi* crops that would have been sown with the aid of canal water. Even in years of less severe drought the supply at present does not always suffice for that purpose. Any measures, therefore, which may promise to make up the deficiency seem deserving of investigation.

520. *Possible utilization of Sardah waters outside Oudh.*—If, as seems most probable, no suitable site can be found for storing water in the upper catchment of the Ganges and Jumna, the only possible source of supplementing their supplies would appear to lie in the Ramganga and Sardah rivers. The connection of these streams with the Ganges has more than once been suggested, but the proposal has never been seriously considered. At the season when extra water is required for the Doab, the Ramganga carries only an insignificant volume; and on the Sardah river the Ganges-Gogra Doab seemed naturally to have the first claim. If, however, it should be decided to introduce canal irrigation only into those districts mentioned in paragraph 512, there would be available a considerable surplus of the Sardah's supply for utilization elsewhere, and the possibility of diverting the surplus to the Ganges river might be investigated more fully than it has hitherto been.

521. So far as the levels of the country are concerned there would appear to be no difficulty in carrying a supply into the Ganges above the head-works of the Lower Ganges Canal from a point on the Sardah where it debouches on to the plains. The connecting channel would no doubt have to cross numerous drainage lines and more than one large river, and the cost of the work would be very great; but, on the other hand, the advantages that could be derived from its construction seem to be sufficiently numerous and substantial to justify a considerable expenditure in securing them. A share of the supply which the Upper Ganges has now to pass on to the Lower Ganges Canal could be diverted to the Agra Canal through the Hindun Cut, without affecting the supply of the Upper Ganges Canal in the way that it is now affected when in times of tight supply it is called upon to assist the Agra Canal. Nor would it any longer be necessary to pass on to the Agra Canal any portion of the Eastern Jumna Canal's share of the Jumna supply. Moreover, were a sufficient volume made available from the Sardah, there would no longer be any difficulty in diverting a portion of the Ganges' supply into the proposed Eastern Ganges Canal; and the connecting channel might also be utilized for supplementing the often insufficient supplies of the Rohilkhand Canals and for irrigating Moradabad and Budaon. It might even be found possible to take a supply from the Deoband Branch of the Ganges



SKETCH MAP
ILLUSTRATING PROPOSALS FOR UTILIZING
THE WATERS OF THE
SARDAR RIVER.



Canal into the lower portion of the Jumna-Hindun Doab, thus setting free a share of the Eastern Jumna Canal's supply for the protection of the Hissar and Rohtak districts at the tail of the Western Jumna Canal in the Punjab. We fully realize that this proposal is beset with many engineering difficulties, and that perhaps the cost would prove prohibitive. We think it right, however, to refer to it as a proposal which, in view of its wide-reaching potentialities, should not be lost sight of if it be eventually decided that the Sardah supply cannot be fully utilized in the Ganges-Gogra Doab.

522. We recognize the objections which may be raised to any proposal for diverting the waters of the Sardah so as permanently to deprive the tract, which by its geographical position has the prior claim, of the opportunities of utilizing them. It may be urged that at some future time the experience of a few years of drought, or the increasing pressure of population, or many other causes, may render the Taluqdars as keenly desirous of irrigation as they are now strenuously opposed to it. We cannot attach much weight to this argument, or recommend in consideration of it that all proposals to utilize the Sardah water to the greatest advantage should be held in abeyance for an indefinite period. We would observe, however, that even if the proposal which we are considering were actually carried out, it would not necessarily follow that Oudh would be finally and irretrievably excluded from canal irrigation. There would still be a surplus available from the Sardah, and it appears possible that if necessary this might be supplemented by the waters of the Gogra for the extension of canal irrigation in Oudh.

523. *The Ken Canal.*—Of the proposals which have been laid before us for the protection of the southern or *trans*-Jumna districts by the construction of State irrigation works, the most important is that for a canal from the Ken river to irrigate the district of Banda in Bundelkhand. The first project for this work was prepared in 1876 when it was proposed to take out a canal from above a dam, 68 feet high, at a point on the river some 40 miles above Banda. The estimate for the work, amounting to 46 lakhs, was held in abeyance until some experience had been gained of the working of the Betwa Canal, which was about to be constructed in a somewhat similar tract of country. The event has shown the wisdom of the postponement; for the project left out of command a large tract containing the very class of soil which the experience of the Betwa Canal has shown to be the most suitable of all the soils of Bundelkhand for irrigation by canal water. The canal as now designed will have its head-works at a point some 30 miles higher up the river than that originally proposed, and will thus be able to command all the good light soils of the district which may be expected to take water every year, as well as the heavier soils commanded by the original project, which only require water in a year of scanty rainfall or when the rains cease at an unusually early date. The project affords a good instance of the necessity for gaining experience as to the suitability of the soils for irrigation before any large expenditure is incurred on the construction of irrigation works in black cotton soil tracts.

524. The revised project is estimated to cost 36½ lakhs and to irrigate 58,000 acres on an average, and 97,500 acres in a year of drought. It is expected to yield annually an average net revenue of Rs. 63,500, or 1·7 per cent. on the capital cost. Expressed in acreage rates the capital cost amounts to Rs. 63·5 per acre of average irrigation, the net revenue to Rs. 1·1, and, allowing for interest charges, the annual loss to Rs. 1·2 per acre. This is only about a third of the annual cost of providing irrigation to each acre watered by the Betwa Canal. The more favourable results anticipated for the Ken Canal are due chiefly to the fact that it commands a tract of country which contains a far larger proportion of the soils which take water in ordinary years than is to be found in the Betwa Canal tract. We have no reason to believe that the estimate is at all over-sanguine. On the contrary, from our evidence we have grounds for hoping that the water will be taken for the irrigation of rice more freely than has been estimated. The *rabi* area should not fall short of the estimate, provided that the supplies anticipated are always available; but we doubt if sufficient allowance has been made for the possibility of shortness of supply during the *rabi* season in a year

of severe drought; and we think that it may be found necessary hereafter, as it has been in the case of the Betwa Canal, to supplement the supply by storage. We would certainly recommend that the weir across the river be constructed so as to store the largest volume of water possible at a reasonable cost, and that with a view to selecting other suitable sites for reservoirs, a detailed examination should be made of the river upstream of the head-works. We understand that some suitable sites have already been discovered. These works will add to the cost; but the need for the canal is so great that its cost, even with such additions as may be necessary for storage, should not be greater than can reasonably be incurred in view of the protection which it will afford to the Banda district. We have no hesitation, therefore, in recommending its early construction.

525. *The Dassan Canal.*—A project for a canal from the Dassan river was prepared many years ago for the irrigation of a portion of the Hamirpur district; but the low supplies in the river and the great height and cost of the weir caused the scheme to be abandoned. A detailed reconnaissance for the purpose of determining the conditions of supply, and the probable utility and cost of the work in the light of more recent experience, will be put in hand as soon as the necessary establishment is available. The information at our disposal is not sufficient to admit of our forming any opinion on the project.

526. *Proposed canals in Mirzapur, Benares, and Allahabad.*—Preliminary surveys have been made for a number of small canals in Mirzapur, and in the southern portions of Benares and Allahabad. The most important of these is for a canal from the Tons river to irrigate a tract in the south of Allahabad. The scheme does not appear to be a promising one. The soil is mostly if not all black cotton soil; and the works would be costly in proportion to the area commanded. Rough projects have also been prepared for small canals from the Belan, Karamnassa, and other rivers. The projects are not in sufficient detail to enable us to form an opinion of their financial prospects; but, as rice is the principal crop that will be irrigated, they promise to be of considerable protective value, and there appears to be no reason why the water should not be fully utilized even in years of average rainfall. One or two of the most promising schemes should now be worked up in detail and carried out, so as to ascertain to what extent the cultivators will use the water and pay for it in ordinary years. The proposed Karamnassa reservoir and canal referred to in the Bengal Chapter (paragraph 412) should, if it fulfils the expectations of its projectors, protect a considerable area in the Benares district.

527. *The Chandraprabha Canal.*—During the course of our tour we inspected a canal from the Chandraprabha river in the private demesnes of His Highness the Maharaja of Benares. The canal, which was constructed about eighty years ago, is now a deep ravine, and it no longer commands the country except at its head and tail. It has cut away a good deal of valuable land and will continue to do so unless its supply is controlled. Nevertheless, the canal irrigates annually about 10,000 acres of rice. Plans and estimates for re-aligning the channel, and providing it with head sluices and other works for the control and distribution of the water, might be laid before His Highness and the advantages of carrying out the work explained to him.

528. *Improvement of the Betwa Canal.*—From the evidence which has been laid before us, we have no doubt that the financial and protective value of the Betwa Canal would be considerably increased by the provision of additional storage, and by the remodelling of the channels to enable them to carry larger supplies. The valley of the river above the head-works has been examined, and some suitable sites have been found for storage works. One or two of the best of these should be selected, and detailed plans and estimates prepared, with a view to the early provision of at least 1,000 million cubic feet of extra storage. This should suffice for the present, but eventually, as irrigation is further developed, it will be necessary to add another 1,500 or 2,000 million cubic feet. The branches of the canal should be remodelled so as to carry between them with safety the largest volume that can be run in the main canal.

529. *Establishment of a farm on the Betwa Canal.*—The chief reason, however, why the canal has failed to yield a return sufficient to cover its working expenses is the fact of its being almost entirely a *rabi* canal. In the early *kharif* season there is very little water in the river; and from June to October, when there is an abundant supply, the canal remains closed. Even increased storage will not add largely to the *kharif* area irrigated, unless the people can be induced to utilize the water for early sowings of rice, of which a large area could be matured during the rainy season. It may be that the soil is unsuited to rice; on this point our evidence is somewhat conflicting. But the question of introducing rice cultivation has such an important bearing on the effective working of the canal that we recommend the establishment by the Agricultural Department of a small farm in the vicinity of one of the distributary channels, for the purpose of experiments in utilizing the water for rice cultivation. We would also recommend a considerable reduction in the water rates charged for rice, so as to induce the cultivators to make experiments for themselves. Some selected cultivators might even be given water free for a few years.

530. *Storage tanks in Bundelkhand.*—The twelve small tanks in the Jhansi and Hamirpur districts which are managed by the Engineer in charge of the Betwa Canal are scattered over a large area, and are situated at a considerable distance from the head-quarters of the canal. We recommend that they be made a separate sub-division; and that for the next few years they be placed in charge of a specially qualified assistant or subordinate who would devote his whole time to their improvement, and to the preparation of projects for new tanks and for field embankments, to be carried out either at once or by relief labour in a year of famine.

(iv).—*Private irrigation works.*

531. *Area irrigated by private works of all kinds.*—There is no part of British India to which irrigation from private works is of greater importance than the United Provinces. For the irrigation from State canals, considerable as it is, is mainly confined to the thirteen districts of the Ganges-Jumna Doab; and thus nearly three-fourths of the Provinces depends entirely for its irrigation on wells and other private works. Out of a total area of 11 million acres under irrigation in an ordinary year, $8\frac{1}{2}$ million acres are irrigated by works of this kind, $5\frac{3}{4}$ million from wells, 2 million from tanks, and the balance of $\frac{3}{4}$ million acres from other sources.

532. *Wells.*—The area irrigated from wells varies very greatly with the nature of the season. In a wet year like 1894-95 it may fall to three million acres; on the other hand, in a year of drought it rises to over 7 millions. The wells are divided into three classes: masonry, half-masonry, and earthen or temporary. The distinction between masonry and half-masonry wells is, however, very indefinite. A cylinder lined with brickwork, laid in lime mortar, is the criterion of a masonry well; but many of the finest wells are made of bricks laid dry, or of brickwork in mortar rising to only a few feet above the subsoil water-level. No doubt in many places the half-masonry wells are less durable than those lined throughout with solid brick work, but the attempt to distinguish between the two classes appears to have led to complications which makes it doubtful if the distinction is worth retaining. It will certainly be more convenient for our purpose to class them all as permanent wells, merely noting that out of 500,000 wells thus classed about 170,000 are of the so-called half-masonry type.

533. *Permanent wells.*—There are, broadly, two descriptions of permanent wells: spring wells, and percolation wells. In the great alluvial tract north of the Jumna a permanent well usually consists of a brick-work cylinder sunk through the upper strata of alternate clay or loam and sand, down to an impervious stratum of stiff clay, known as the *mota*, through which a hole is made into the sandy stratum below. Through this hole a plentiful supply of water rises into the cylinder, sometimes to a height above that of the general level of

the subsoil water table outside the wells. These wells are therefore designated spring wells. When the hole is first made through the stiff clay stratum or *mota*, as it is usually called, a certain quantity of sand is forced up into the well with the water. After a short time the emission of sand ceases, and if the *mota* is a good one (3 to 5 feet of hard clay) no further sinking of the well takes place. The emission of the sand ceases only when the hollow inverted cone, which forms below the *mota*, presents a large enough surface to admit of the required volume of water being discharged through it at a velocity which will not disturb the grains of sand.* The cost of a well of this description depends chiefly on the depth to the *mota*, which may be great even though the subsoil water is high. The average cost to the cultivator of a well of two buckets may be put at Rs. 200 to Rs. 300, and the average area which each well will irrigate during the *rabi* season at 8 or 9 acres. The most effective spring wells are to be found in the Ganges-Jumna Doab, but they are found in largest numbers in the southern and eastern portions of the central or Ganges-Gogra tract.

534. When the *mota* is at a great depth or does not exist, water can only enter the well slowly by percolation through its sides or through the sand on which the well must rest. The well has then to be of much larger diameter than is necessary in the case of a spring well; otherwise the sand would be drawn with the water into the well and the masonry cylinder would gradually sink. Wells of this description are common in the sub-montane tract, and in the low-lying lands of the river valleys. Although of larger diameter, they are usually of less depth than the spring wells. They are cheaper to construct, but irrigate a smaller area.

535. In many parts of the districts south of the Jumna the wells are of the percolation type. Outside the black soils, in which hardly any wells are or can be made, rock is usually met with below the surface; the lining of the cylinder generally consists of rough stone masonry, and this frequently, as in the Deccan, is limited to the staging required for the lifting gear. The rock is excavated to form a reservoir for the water which issues from the porous soil or through fissures in the rock.

536. *Increase in the number of permanent wells.*—During the past decade the number of masonry wells in use for irrigation has increased by 51,000 or by about 12 per cent. This increase though substantial is proportionately much less than those shown in the provinces of Madras, Bombay, and the Punjab. The fact, however, of a very large increase during the past 30 years, in the districts which have recently come under revision of settlement, is unhesitatingly affirmed by all Settlement Officers, and may be accepted. In the eleven districts of Oudh the number recorded at settlement has risen from 50,835 to 119,942, an increase of 136 per cent. In some parts of these districts the number of wells is now so great that there scarcely seems to be room for any further large increase without affecting the supply of water in existing wells in dry years. For instance, in the Haidargarh pargana of Barabanki, covering an area of over 100 square miles, there are 27 wells to the square mile of total area, or one well to every 14 acres of cultivation, and more than two-thirds of the wells are permanent. But the principal cause of the small increase during the past decade in the number of masonry wells, in these as compared with other provinces, is no doubt to be found in the reliance which is placed on temporary wells.

537. *Temporary wells.*—In no province in India are the general facilities for the construction of small temporary wells at all comparable with those of these provinces. There are no doubt large numbers of such wells in the Punjab, but even in that province there are four masonry to one temporary well, and the total number of temporary wells does not exceed 75,000. Whereas in the United Provinces in a dry year nearly a million temporary wells are in use for irrigation, that is, for each permanent well there are two temporary wells. They differ from the permanent wells in being lined with a cylinder of wood, wicker-work,

* This theory of the action which takes place in a well was first advanced by Mr. J. S. Beresford of the United Provinces, Irrigation Department.

or brushwood, instead of masonry. The lining, as a rule, is carried up to only a few feet above the water surface. The temporary well may, like the permanent well, receive its supply either from a spring or from percolation. Where the supply is wholly by percolation the temporary well is a mere hole in the ground from which water is drawn by manual labour with the aid of a wheel or a weighted lever. Such a well seldom irrigates more than two acres, and often only a mere fraction of an acre. A good spring well of the temporary kind, such as are found extensively in the Ganges-Jumna Doab, will irrigate four or more acres in the season. They are worked by bullock power and occasionally carry more than one water-bag. The cost of a temporary well may be anything from Rs. 2 to Rs. 50 according to its depth and the nature of the lining.

538. *Famine protective value of wells.*—We have already (paragraph 508) drawn attention to the fact that in these provinces the use of wells for irrigation, other than that of sugar-cane and garden crops, is confined almost entirely to the *rabi* season, and that they are of little value in affording protection to the *kharif* crop. But there can be no doubt that in 1896-97 it was the wells, and the wells alone, which saved the greater part of the Ganges-Gogra Doab from a famine which would have rivalled in intensity that of Bundelkhand. They made possible the sowing of the *rabi*, and the replacing over a large area of the failed *kharif* by *rabi* crops. Largely owing to the prompt and timely action taken by the Local Government in granting liberal advances under the Loans Act, over 550,000 temporary wells were made in that year, the construction of some thousands of masonry wells was put in hand, and many others were repaired and improved. Probably not less than half the extra number of temporary wells were made with the aid of the money advanced. But in addition to this, as was observed by the Local Government at the time, the value of the policy consisted not merely in the amounts advanced and the number of wells which the cultivators were thereby enabled to construct, but in the stimulus which was given to private effort and the confidence inspired in the Government. It is difficult to conceive a more striking instance of the success of the policy, which we have strongly recommended elsewhere, of making, at the earliest possible stage of a threatened famine, large and liberal advances for the construction of temporary wells, as well as for seed, cattle, and lifting gear.

539. *Scope for the extension of well-irrigation.*—After careful consideration, we have come to the conclusion that, notwithstanding the large extent to which well-irrigation is already practised in the United Provinces, there is wide room for its extension. In Bundelkhand, the tract most exposed to famine, nothing can be done in the black soil tracts for which well-irrigation is altogether unsuitable. But in the south of the Jhansi district, and in a few other parts of Bundelkhand, there are red and mixed soils perfectly suited to irrigation, and water is available at moderate depths. Particularly favourable conditions exist near the so-called 'lakes' of Hamirpur and the smaller tanks elsewhere, in the proximity of which the water level is raised. By the embanking and terracing of other parts of the country the water level for purposes of well-irrigation may be raised materially. The wells also are for the most part permanent and durable. In these tracts, therefore, as in the Deccan, all the concessions and methods which we have advocated in the general chapters on private irrigation works and loans for improvements, may appropriately be offered and tried. Of the great alluvial tracts north of the Jumna the only parts in which well-irrigation is impracticable are those, mostly in the neighbourhood of the high banks of the great rivers, in which the subsoil water is found at prohibitive depths. Elsewhere distinctive treatment must be adopted according to the requirements of districts and parts of districts.

540. In the districts of the Ganges-Jumna Doab, which are liberally provided with canal irrigation, no special measures will be required, except possibly in those few localities which cannot be reached by canals or their extensions. In such localities, which are generally favourable for the construction of permanent wells, advances should be given freely. But, so far as we can judge, free grants-in-aid will not be required.

541. In parts at least of the Ganges-Gogra Doab a greater measure of liberality will be justified. The districts of the Lucknow Division which are situated in the centre of this tract suffered severely in the famines of 1896-97 and 1877-78, and in parts of them all there is considerable scope for the extended construction of permanent wells. Here grants might be allowed in addition to advances. The western portion of the tract, comprised in the Rohilkhand Division, suffered considerably in 1877-78, but escaped easily in 1896-97. It is also doubtful whether, except perhaps in the district of Budaon, conditions are favourable to the construction of permanent wells. The matter should be carefully inquired into, and wherever permanent wells can be made with advantage their construction should be sedulously encouraged by advances; but grants need not be made until the wants of other tracts, where the necessities are greater, have been satisfied. In the Fyzabad Division of Oudh, in the district of Jaunpur, and in parts of Allahabad and Benares in the south-eastern angle of this Doab, well construction has advanced so far that special measures of encouragement are not urgently required. The same also may, perhaps, be said of the districts of the Gogra-Gandak Doab, in many parts of which, also, tank-irrigation is generally very efficient.

542. *Takavi advances*.—There is, however, probably no district in which *takavi* might not be granted for permanent wells on a materially larger scale than at present. The majority of our witnesses are not enthusiastic as to the amount which can be done in this way, and the Hon'ble Mr. Roberts, the Local Member of the Commission, has rightly drawn attention to the difficulties which are certain to be encountered owing to the sub-division of holdings, the want of co-operation, peculiarities of tenure and other causes; and he does not, like most other local members, press for large increases in the *takavi* allotments, or express any hope that the progress of well construction can be materially accelerated by anything which Government can do. We agree that here, as in other parts of India, the progress in the construction of permanent wells to be healthy must be gradual. But we are not satisfied that the possibilities have been exhausted. Individual officers have occasionally been very successful in the distribution of *takavi* in ordinary years; for instance, Colonel Pitcher, who in one season distributed over half a lakh of rupees in a small district. Over the Provinces as a whole, the amounts advanced in ordinary years have been very small; and it is clear that, generally speaking, no strenuous or sustained endeavour has been made to stimulate the execution of private improvement by means of *takavi*. Until an endeavour of the kind has been made and failed, the attempt ought not to be abandoned.

543. As in other provinces, the procedure is capable of substantial improvement on the lines indicated in Chapter VI. In particular, subordinate district officers should be everywhere empowered to make advances without reference to the head of the district, and the necessary inquiries should be made by them and money advanced on the spot. Borrowers should also be allowed free option of long terms of repayment, fixed solely with reference to the durability of the work. In the Doabs, however, some caution may be necessary in this matter, as the life of wells is uncertain. But it should be within the discretion of the officer granting the loan to allow a period up to at least twenty-five years.

544. With regard to difficulties of tenure and the like, we first observe that the people who are likely to take the advances are the smaller zamindars and permanent tenants. With regard to the former no difficulties arise. Their land is freely available as security for advances, and under existing rules long periods of exemption from taxation are allowed. In Bundelkhand there should be no objection to making the exemption perpetual. The resulting loss of revenue should be trifling, and the need of wells as a protection against famine is so great, that no measure of liberality allowed elsewhere ought perhaps to be denied here. It may be doubted, however, whether the grant of perpetual exemption will have much practical effect. Elsewhere in the United Provinces it is quite unnecessary, for the mere purpose of encouraging the construction of permanent wells, to make this concession.

545. *Improvements by tenants.*—As regards tenants, however, it is impossible to say that under the existing law they enjoy everywhere a fair measure of protection against the enhancement of their rents after they have constructed wells. In Oudh the law grants no protection beyond fixing rents for seven years—a period obviously insufficient to exhaust the value of such an improvement as a permanent well. But there is no part of the United Provinces in which the construction of permanent wells has made more regular and consistent progress than in Oudh; and the best informed settlement and revenue officers seem to think that those landowners, who are least disposed to encourage tenants in such construction, do not succeed in preventing it by enhancement of rent. This is due to the fact that in Oudh there is little or no difference between the rates of rent on irrigated and unirrigated land (hereafter referred to as the wet and dry rates), and that neither kind of rate is excessive. It would probably, therefore, not be worth while to make any serious alteration in the Oudh rent laws, with the object of protecting the tenant from the trifling enhancement to which he is at present liable on construction of a well. In the Province of Agra, however, the excess of wet over dry rates is frequently considerable, and the case is therefore different. Here tenants with a permanent right of occupancy are also provided that their rents shall not be enhanced on the ground that the productive powers of the land held by his agency or at his expense. By another provision, improvement effected by the tenant is below the prevailing rate paid by however, the landowner is allowed to claim an enhancement of rent on the ground that the rate paid by the tenant is not exempt from enhancement of it. The consequence is that a tenant, who for the first time introduces well-irrigation into a tract previously unirrigated, is not exempt from enhancement of his rent up to the rate prevailing on land in the same neighbourhood, in which similar facilities for irrigation exist. Hence if a tenant make a temporary well he will be called upon to pay the wet rent rate on land irrigable from it; and apparently if he replaces an inferior earthen well by a permanent masonry well, and so contrives to irrigate a larger area than before, he will be liable to pay the wet rate on the additional area. It is worthy of consideration whether the law ought not to be made more liberal for the tenant. The existing provisions are defended on the ground that the difference between the dry and the wet rate is the equivalent of a royalty on the subsoil water, to which the landowner is fairly entitled. Admitting this, however, it must be remembered that Government is entitled to take a similar royalty from landowners when they make irrigational improvements, and that Government foregoes its share of this royalty for at least a whole thirty years' period of settlement. Tenants who make similar improvements would seem to be entitled to receive from the landowners not less liberal treatment than improving landowners receive from the State. We submit, therefore, for consideration the suggestion that when a tenant constructs a permanent well, the land commanded by which was previously unirrigated and assessed only at dry rates at the time of the construction of the well, the land should be exempt from wet rates until the expiry of ten years after the period for which the tenant is entitled to hold the land at the existing rental. Thus, if a tenant constructs the well at the commencement of the ten years' period for which his rent cannot be enhanced, he will secure exemption from wet rates for a period of twenty years. Such a measure as we propose would, we believe, prove an effective inducement to tenants to make permanent masonry wells. It may be opposed by the landowners, but if it results in the extended improvement of their land it will tend to their permanent benefit. It cannot be considered unjust to them, since the additional period of exemption suggested for the tenant's improvement is only one-third of that which the landowner receives from Government for his own improvement.

546. *Transfer of occupancy rights.*—Another difficulty in getting money advanced to tenants which has been brought to our notice is this: the land of tenants not being legally transferable except to a very limited extent to co-sharers in the tenancy, and by sublease, cannot be received as security for the advance. As a remedy it has been proposed by one competent witness that the interest of occupancy tenants in their land should be

made transferable for purposes of recovery of *takavi* advanced to them, and that a special law, of which he has furnished a draft, should be passed for this purpose. The great majority, however, of local officers seem to be strongly averse from such a measure, which would no doubt be opposed by the landowners. We accordingly hesitate to recommend it. But as pointed out in the general chapter on *takavi*, legislation of the kind has been passed in the Central Provinces, and if the result is to facilitate the advance of *takavi* to tenants, without causing substantial injury to either landowners or tenants, the advisability of undertaking further legislation in the United Provinces might be seriously considered.

547. *Boring tools*.—We have had frequent occasion to mention the clay beds from below which the supply of what are termed spring-wells, whether permanent or temporary, is drawn. The distribution of these beds and their depth below the surface are extremely variable, and on these factors depends largely the suitability of any tract for the construction of the different kinds of well as well as the success of individual wells. The people are said to be wonderfully well-informed as to the distribution of the beds. Nevertheless, instances are very frequent in which wells fail owing to failure to strike them, or to finding them of insufficient thickness; and with the object of ensuring more uniform success the Agricultural Department has recently employed a small establishment equipped with boring tools, and men and tools are lent for a small fee to landowners and cultivators who desire their services. We think that this system deserves extended trial, and have made similar recommendations for other provinces.

548. *Tanks*.—There are practically no embanked private tanks of any considerable size in the United Provinces. Close to almost every village there is a pond, the excavation of which afforded materials for the construction of the dwelling houses; and occasionally in some parts of the country, especially in Mirzapur and the Bundelkhand districts, water is held up by small embankments across depressions or drainage lines. But, except in Mirzapur and the adjoining *trans-Jumna* districts, where the tanks are often fed by diverting natural streams, these two classes of tanks are used chiefly for watering cattle and bathing purposes; and the *jhils* or natural depressions which are found in large numbers, more especially in the eastern districts of the sub-montane and central tracts, account for nearly the whole of the irrigation classed under tanks. In a favourable year over $2\frac{1}{4}$ million acres are irrigated from this source; but in a year of drought the supply of the tanks fails and the area falls to under a million acres. In many districts, in a year of severe drought, it may even be reduced to one-fourth of the area of a normal year. But though the tanks fail when they are most required, their protective value is very considerable. They ensure a good crop to a large area in all ordinary years; and occupying as they do a considerable portion of the ground surface, their effect in maintaining the level of the subsoil water must be very great.

549. *Canals for filling jhils*.—It has been suggested that some of the large snow-fed rivers, all of whose waters are not required for direct irrigation from canals, might be utilized to fill the tanks in a year of drought. We have no doubt that the supply of many tanks could be assured by this means, and the proposal has the great advantage of interfering to the least possible extent in the vested rights of the cultivators to the waters of the natural *jhils*. But the cost would probably be great in proportion to the advantages conferred, and we are doubtful as to the ultimate benefit to the country. The water would no doubt have to be lifted before it was delivered on to the field, and thus the loss of water from the village channels would be reduced to a minimum. But, on the other hand, the larger area of ground which the water would cover, both in the *jhils* themselves and in the channels constructed for conveying water to them, would lead to an increased percolation into the subsoil. This would mean an addition to the subsoil water and a counteraction of the effect which dry years now have in retarding the rise of the subsoil water level. The addition would be immaterial if it

were certain that the canal would only be used in years of really serious drought. But when a canal had once been made, we think it very unlikely that its use would be rigidly confined to such years. It would in all probability be opened and used when there was any hope of its water affording real and immediate benefit to the cultivator. If this were the case the effect which dry years undoubtedly have in preventing a rise in the subsoil water level and in maintaining its present equilibrium, would be considerably diminished; and the result would infallibly be a gradual rise of the subsoil water table. Once the present equilibrium had been upset, sooner or later, the rise would become serious; and we should not then have, as in the case of a canal for direct irrigation, the counteracting effect of an efficient drainage system. Efficient drainage means the emptying of the *jhils*, and keeping them empty for as long as possible; a result which would obviously be incompatible with any arrangements for keeping them filled or even partially filled. On these considerations we are doubtful of the advisability of constructing *jhil*-filling canals extensively in any part of the country in which the spring level is already high. At the same time we recognize the danger of generalizing on any question of the kind. The probable advantages and disadvantages of a canal for filling *jhils* in any tract can only be determined by detailed local observations and inquiries, and by careful observation of the effects of a rise or fall in the level of the *jhils* on the water surface of the wells in their vicinity.

550. *Other private works.*—Irrigation by lifting water from streams and rivers, or by diverting it into small private canals or river channels, accounts for most of the three-quarter million acres irrigated from 'other sources.' Nearly half of the area shown under this head is comprised in the three districts of Shahjahanpur, Gorakhpur, and Basti.

551. *Messrs. Peppé's and Holdsworth's canals in Gorakhpur.*—Of individual works the canals which have been constructed by Messrs. Peppé and Holdsworth in their estates in the Gorakhpur district are remarkable instances of what can be done by private enterprise for the development of irrigation; and also of the great benefit of water to rice cultivation even where the average rainfall exceeds 60 inches, if it is liable to be deficient or unfavourably distributed throughout the season. In Mr. Peppé's estates an area of about 40,000 acres has been brought under irrigation by constructing earthen embankments, provided with sluices for passing flood waters, across those streams which, rising in Nepal, flow through the estates. By this means the water is held up and diverted into more than 100 miles of irrigating channels. The embankments form reservoirs from which the upper 5 or 6 feet can be drawn when the volumes in the rivers fall below requirements. A portion of the flood water is also diverted and stored in a neighbouring depression. Mr. Peppé's works, it is satisfactory to note, have been imitated on a smaller scale by the native owner of an adjoining estate; and the good example which he set might apparently be followed with considerable advantage in other estates if the owners could be persuaded to combine. Of the possibility of this Mr. Peppé is, however, by no means hopeful. We should note that the water supplied by these works is used chiefly for rice. It is also taken for a small area of *rabi* crops, but for these, with a view to the prevention of water-logging, the cultivators are made to lift the water on to their fields. The works in Mr. Holdsworth's estates consist of a number of small reservoirs in which the local rainfall is collected for the irrigation of about 15,000 acres of rice and *rabi* lands.

552. *Field embankments.*—There are no records showing the area of embanked fields in the United Provinces; but in the *trans-Jumna* districts, small embankments, 3 or 4 feet high, similar to those of the adjoining districts of the Central Provinces, afford valuable protection to a considerable area.

553. *Extension of private works other than wells.*—In most of the sub-montane districts there appears to be still room for the construction of small canals and other private works for utilizing the waters of hill and local streams; but for these no special measures appear to be necessary. In the case of larger works, which would irrigate in more than one village or estate, it would be better

for Government to undertake their construction as State works. The only classes of private works, other than wells, in connection with which the assistance of Government is urgently required are the tanks and field embankments of Bundelkhand. By the construction of the Betwa Canal a large portion of the Jalaun district has been rendered fairly secure. The Ken and Dassan projects will, it is to be hoped, afford similar protection to large areas in Banda and Hamirpur; but in all these districts, more especially in Jhansi and Hamirpur, there will still remain large areas, which will have to depend for their protection on the utilization of the local rainfall. The area that can thus be provided for will be small; the works themselves will be small and scattered; and, at the best, the protection afforded will be incomplete. But, excepting works in the Ken and Dassan canal projects, there are no possible irrigation works in the United Provinces, which are of more pressing necessity than these, or to which the attention of the Irrigation Department can be more usefully directed. Here, as elsewhere, these small works will be liable to fail in a year of drought. There is no doubt, however, that the villages which suffered most during the recent dry years were those which had no tanks; and we have had ample evidence, from Mr. Silberrad, the Sub-divisional Officer of Lalitpur, and others, of the general benefits derived from the tanks and embankments, and of the good results of the repairs and improvements carried out during the famine of 1896-97 and the drought of 1899-1901. When an Engineer has been appointed, as recommended in paragraph 530, and provided with the required staff, the first measure necessary will be a systematic reconnaissance of each separate catchment, and a survey of the tanks at present existing and of any suitable sites for new tanks. The tanks which seem worth repairing should then be selected; and in each case a rough estimate should be made of the cost of placing the work in a thorough state of repair, and of providing it with a proper outlet and an escape for flood waters. Rough estimates should also be made of the cost of possible new tanks, including large field embankments, and in each case an estimate should be made of the area likely to be benefited. With these estimates available, and the assistance which Government can reasonably be expected to render in carrying out the work can be considered. It can then be decided whether a detailed project and estimate is worth preparing, with the object either of having the work carried out at once as a State or private work, or of having it brought on to the programme of relief works.

554. In respect of the extent to which Government assistance will be required our information is not sufficiently detailed to enable us to form any definite opinion. But we have no hesitation in saying that, generally speaking, very much more liberal assistance will be needed, and may reasonably be rendered, than that which we have recommended for similar works in the Central Provinces (paragraphs 356, 361, 362, 375, and 376). With this reservation our recommendation regarding those works may be read as being generally applicable to these. The recommendation made in paragraph 375, that in certain cases Government should bear the whole cost of the work if the tenants agreed to pay a small annual charge on the acreage benefited, would appear to be specially suitable to the small tanks and field embankments of Bundelkhand. No work either of improvement or construction should be undertaken until the land-owners concerned have agreed to be responsible for the annual petty repairs. The recommendations regarding acquisition of land (paragraph 362) may be taken as applicable to all districts of these Provinces in which there are private canals, or in which there appears to be any scope for their useful extension.

(v).—*Famine works and programmes.*

555. *Famine of 1896-97.*—There have been no works of famine relief carried out in the United Provinces since 1896-97; and as the works carried out in that year have been dealt with in the Report of the Famine Commission of 1898, it is unnecessary for us to refer to them beyond noting that, out of a total expenditure of 121 lakhs incurred on works of relief, Rs. 20,000 only were spent on actual works of irrigation. This small sum was spent by employing relief labour on the Fatchpur Branch of the Lower Ganges Canal, which

construction as an ordinary work. Over 55 lakhs were indeed spent in improving and deepening tanks, and in constructing a few new tanks in the Banda district, and we have had evidence as to the real utility of some of these works in extending irrigation and rendering the water-supply more secure. But the vast majority consisted of mere deepening of village tanks, which are used almost entirely for domestic purposes and supplying water to cattle. These works have their own use; but we have no doubt that, at least in the districts south of the Jumna where the famine was most felt, many of much greater and more permanent utility than those which were actually carried out, could have been provided if projects had been in readiness for the improvement and repair of existing irrigation tanks, and for the construction of new tanks and field embankments.

556. *Programmes of relief works.*—The latest programmes which were laid before us certainly provide ample work for any number of people who are likely to require employment; and village works occupy a prominent place in the programme of almost every district. The great bulk of the work, however, still consists of raising roads, collecting road metal, and deepening village tanks; and in most part of the Provinces this must continue to be the case. But, in the south-Jumna districts at least, where famine is most frequent, we have no doubt that, if the proposals made in the previous section are accepted, it will be possible to substitute for some doubtful works now on the programme a number of really useful irrigation works, including field embankments.

557. *Works in ravines.*—While in Bundelkhand we had an opportunity of inspecting some small tank works at Raksha, which were constructed 14 years ago by Mr. G. E. Ward, at that time Commissioner of Jhansi. The object of these works was to check scouring and ravining, caused by the too rapid off-flow of the rainfall, by throwing across the minor drainage lines a series of low banks, so that after heavy rain there should be a succession of shallow ponds, the water in which would by degrees soak into the subsoil and tend to raise the spring level in the neighbouring wells. The banks would at the same time check the denudation of soil which would be deposited in the ponds and form a bed of good soil which could be sown with a *rabi* crop as the water disappeared. A similar system has been practised largely by the French Forest Department in the valleys of the Alps. We found that the deposits above the banks at Raksha were not very extensive, and that no attempt had been made to cultivate above the banks; but the banks have been useful in increasing the cold weather supply of the stream, and in maintaining the water level of the wells in the immediate vicinity where there was a large area under cultivation. Any measures for checking denudation and retaining water in Bundelkhand are desirable; but a number of years must necessarily elapse before any tangible results can be obtained such as would justify considerable expenditure on them by the State, more especially where the people cannot be relied on to do their part in keeping them in repair. Nevertheless we think that they are works on which, in the absence of anything better, relief labour may with advantage be employed, if suitable sites have been carefully selected beforehand.

enatha Canals will, it is said, suffice for all the relief labour likely to be required in the next 11 years. And with a people so well accustomed to migration there would appear to be no objection to drafting relief labourers on to these works. When the necessary observations have been made of the supplies likely to be available for contemplated works, the programmes should be extended so as to include not only a sufficient number of test-works, but also all schemes which promise to have any real protective value.

SECTION II.—BALUCHISTAN.

567. *General conditions.*—The information which is available with regard to irrigation in Baluchistan is necessarily incomplete. Only a small portion of the province is under British rule, and it is only about 25 years since the British Government has been in any way connected with the administration of the country. The population, especially in the districts of Thal Chotiali and Zhob, is scanty, and in many parts the inhabitants are accustomed to retire with their flocks across the border when forced to do so by unfavourable seasons. The people are shepherds rather than agriculturists. The extension of irrigation works, giving a fairly permanent supply of water, would induce the people to settle down and take to cultivation. Unfortunately, in many parts of the province, the only sources of supply for irrigation purposes are the floods which come down from the hills with great velocity; they last only for a short time, and the water is heavily laden with silt.

568. *Rainfall.*—In the plains and lower valleys the annual rainfall varies from 3 to 7 inches, and is received chiefly during the summer months. The higher portions of the province (3,000 to 7,000 feet) receive 5 to 11 inches chiefly during the winter season.

569. *State irrigation works.*—There are only two State irrigation works in Baluchistan—the Khushdil Khan reservoir and the Shebo Canal, both in the Quetta-Pishin district. These two works, constructed at a cost of about 16 lakhs, irrigate annually an area varying, according to the nature of the season, from 4,000 to 8,000 acres; and they yield a return of only 1 or 2 per cent. on their capital cost. Improvements which are now being carried out, with the object of increasing the catchment area, will render the Khushdil Khan reservoir a more useful and profitable work; and it is possible that closer professional supervision may increase the utility of the Shebo Canal.

570. *Extensions of State irrigation works.*—The possibilities of constructing new works, both State and private, have recently been investigated by Mr. Mellor, of the Punjab Irrigation Department, who has submitted a list of thirteen proposed State works. Their sites all lie in the two British districts of Quetta-Pishin and Thal Chotiali, and in the districts of Zhob and Chagai which are directly under British administration. They are small works, costing from five thousand to four lakhs of rupees, and are chiefly for the utilization of flood waters. It is evident from Mr. Mellor's reports that there is not much scope for the extension of State irrigation works for the utilization of surface water, all permanent supplies of surface water being at present almost fully utilized. We have referred in the previous section to the risk of constructing in thinly populated tracts, works which would be dependent upon a scanty local rainfall, as they would probably have the effect of bringing in settlers for whom it would be difficult to provide in a bad season.

571. *Private irrigation works.*—The private irrigation works consist largely of works for drawing off the flood waters of hill torrents or the waters of perennial streams. But the great feature of cultivation in Baluchistan is the *karez*. Field embankments are also extensively made. These classes of works are thus referred to by Major MacMahon, Revenue Commissioner, in his Report on Irrigation Works in Baluchistan:—

The *karez* is an underground tunnel which taps a supply of water in high ground and leads it on to the surface of lower lying country. The system is greatly resorted to, and to it

are due most of the fertile spots in Baluchistan. The *karez* requires skilled labour in its construction, and is not a work on which famine labour can be employed. The country, however, lends itself to such works, and very large areas can be brought under cultivation by their means. *Karez* construction is extending gradually. It must remain a purely *zamindari* work, helped by *takari* advances. Such help should be generously given, as the *karez* is the great stand-by of the country. After inspection of a large portion of Baluchistan, one is convinced that the *karez* must be depended on to do most towards furthering cultivation.

The only other permanent cultivation depends upon the small permanent supplies of water which are to be found in several streams where they debouch on to the extensive level valleys which lie between the main ranges of hills. The two rivers of the country are the Zhob and the Nari. The permanent supply of these rivers is made full use of.

Cultivation depending on rainfall is as follows: crops sown and matured by rainfall in the area cultivated; crops sown in plots which are flooded to a depth of 2 or 3 feet by means of *bands*, the drainage being held up on the lower slopes at the foot of hills; and, thirdly, crops sown in land on to which flood water has been diverted from the neighbouring large drainage channel.

The only means of extending cultivation lies in—

- (a) *Karezes*.
- (b) In making use of small permanent supplies in nullahs by bringing down in pipes water which would otherwise be lost in the shingle beds before cultivable land is reached.
- (c) In making better use of the violent floods which run in most drainages after heavy rain.
- (d) In the neighbourhood of Quetta there are several artesian wells and other parts of Baluchistan probably offer sites, and it is hoped to push work vigorously in this direction, as most of the water from the rainfall soaks down deep into the porous soil, and can only be brought to the surface for irrigation purposes by this means.

572. *Artesian wells*.—With reference to (d), we may add that experimental borings in Baluchistan would appear to offer more hope of securing artesian supplies at a moderate depth than in any other part of India. The wells which have already been made in the Quetta valley are all confined to a very small portion of the province, but there is no reason to suppose that artesian waters at the same moderate depths do not exist in other parts. On the contrary, in Mr. Vredenburg's report already referred to (I, 217), it is stated that the structure of the alluvial deposits in the valley-plain of Quetta is by no means special to that locality, but is common in a greater or less degree to all the talus deposits that fringe the high mountains of Baluchistan.

CHAPTER XXI.—NATIVE STATES.

(INCLUDING AJMER-MERWARA, BERAR, AND COORG.)

SECTION I.—RAJPUTANA.

(i).—*Local conditions ; use and value of irrigation.*

573. *Physical and agricultural conditions.*—Rajputana, with an area of about 130,000 square miles, embraces 20 separate States together with the British districts of Ajmer and Merwara. In its physical and agricultural aspects it presents an extraordinary diversity, including every gradation from the sandy and almost rainless plains of Jodhpur and Bikaner with their semi-nomad population and ever-shifting cultivation, to the smiling wheat valleys of Kotah, where the crops are more liable to suffer from excessive than from deficient rainfall, or to the black soils of Partabgarh, where even opium can be grown without irrigation, and where, until 1899, famine is said to have been unknown. Almost the whole north-western half of the province, comprising the greater portion of Jodhpur and Jaisalmer, the Shikhawati district of Jaipur, and all except a small corner of Bikaner, is one immense sandy plain traversed by long lines of sand-hills. Within this area the rainfall varies in annual amount from a few inches in the north and west to about 14 inches along the south-eastern border of the desert. It is seldom sufficient to cause any surface flow, and any storage of water for irrigation purposes is out of the question. The subsoil water lies at a depth varying from about 100 or 150 feet in the south-west and north-east to upwards of 300 feet along the borders of Sind and Bahawalpur, so that irrigation from wells is also impracticable except at a prohibitive cost. Thus within this extensive tract there is practically no irrigation except in the extreme north of Bikaner, where the sand gives place to loam and a small area is irrigated from the Ghaggar Canals and from any surplus water that may be passed on from the Punjab through the Sirhind and Western Jumna Canals. The scanty population support themselves chiefly by their vast herds of camels, cattle, and sheep. Such cultivation as there is—mostly millets, pulses, and melons—is dependent entirely upon the rainfall, all of which sinks into the sandy soil, so that a very small fall is sufficient to bring the crops to maturity. But they are not always blessed with even that small modicum, and partial or total failure of the crops is a common occurrence.

574. The country generally slopes upward from the Rann of Cutch and the valleys of the Indus and Sulej rivers until it meets the abrupt northern slopes of the Aravalli range between Abu and Ajmer, or the succession of isolated hills which mark the continuation of the range from Ajmer to the borders of the Gurgaon district. South-west of Ajmer, along the line of the Luni river and immediately under the northern slopes of the Aravallis, there are good breadths of permanent cultivation ; but, speaking generally, the Aravallis may be said to form a broad dividing line between the sandy desert on the north-west and the hilly and more fertile south-eastern portion of Rajputana. South-east of the range, instead of a uniform and desolate waste of sand, there are extensive ranges of hills, wide river-valleys, open plateaux, deep ravines, and broad stretches of rich alluvial soil—a country generally of good cultivation and with fair facilities for irrigation. Here maize, *juár* and cotton, wheat, barley, gram, opium, and sugar-cane are freely grown. The rainfall, however, is precarious and partial, varying much from year to year, and in the same year from place to place. The average annual fall gradually increases from a minimum of less than 20 inches on the central watershed (Ajmer and Merwara), to about 30 inches in the extreme east (Dholpur), and to nearly 40 inches in the extreme south (Partabgarh and Banswara). The two British districts

of Ajmer and Merwara, the northern half of Mewar, and the southern half of Jaipur, the States of Kishengarh and Shahpura, and a portion of Tonk, lie on or near the limits of the two monsoon currents—one from the Bay of Bengal and the other from the south-west. This tract receives in some years an ample share of both monsoons, and in others only the 'fitful remnants of one. Thus the annual rainfall is extremely variable. It is sometimes more than double the average; on the other hand, it has been only about half the average in no less than six years since 1860. All these years, and others in which the rainfall, though sufficient in amount, was badly distributed throughout the season, were years either of scarcity or of famine. But the liability to famine is not confined to this tract. All the States to the north and east—Alwar, Bhartpur, Dholpur, Karauli, and Bundi—suffer periodically from deficient rainfall. Those to the south—the hilly part of Mewar and the States of Kotah, Jhalawar, Sirohi, Dangarpur, Partabgarh, and Banswara—are favoured with a more abundant and somewhat steadier rainfall; but recent experience has shown that their position also is by no means secure.

575. Looking to the records of the past it may be said that Rajputana is liable to suffer once in every 40 or 50 years from an almost complete and general failure of the monsoon rainfall, leading to widespread and severe famine; and that, in addition, all parts of the province, except the more favoured southern and eastern States, are subject to distress and scarcity, arising from a more or less local and partial failure of the rains, once in every six or seven years. Of the winter rainfall of Northern India, the province generally receives only an insignificant share.

576. *Value of irrigation.*—In a province in which the rainfall is so precarious and the cultivation dependent upon it so insecure, there can scarcely be any question as to the utility of irrigation. We have had ample evidence laid before us to show that where cultivation is possible, the soil, even when falling under the generic designation of black cotton soil, is suited to and repays irrigation; that, where water has been provided, the demand for it is practically constant and unlimited; and that, however great the extent to which it may be found possible to multiply irrigation works in the cultivable parts of Rajputana, there need be no apprehension lest the water should remain unused.

(ii).—*Existing State irrigation works.*

577. *Sources and extent of irrigation.*—Excepting the Ghaggar, the Mahi, and the Chambal with some of its tributaries, all the rivers of Rajputana have their sources within the province and are dependent for their supplies upon the local rainfall. With one or two exceptions they all run dry, or practically dry, soon after the rainy season. They are therefore but ill-suited for the direct supply of canals; while the Chambal—the one river which affords a perennial supply—traverses that part of the province which has hitherto been least in want of water. Thus Rajputana depends for its irrigation almost entirely upon wells and storage tanks. South and east of the Aravalli range, water is generally found fairly close to the surface, and there are numerous wells in every State; besides numberless old tanks scattered over the face of the country, many of them only large enough to provide water for domestic purposes. But even the smallest of these are not to be despised. They provide drinking water for men and cattle; the moist bed, fertilized by alluvial deposits, is cultivated as the water recedes; and many of them influence the wells by raising and maintaining the level of the subsoil water for a considerable distance around them—an effect which is perceptible even in years of drought when the bed of the tank is empty. Nearly all the tanks which are used for purposes of direct irrigation have been made of recent years, through professional agency and at the cost of the Durbars, though some of the largest and best were made many hundreds of years ago. The States which have been foremost of late years in providing funds for irrigation works are shown in the following statement. We have not been able to procure complete and accurate statistics of the extent of cultivation and irrigation in all the various States, but the figures given below, relating to

certain States and to the British districts of Ajmer and Merwara, may be taken as fairly correct:—

| Name of State or Territory. | AREA IRRIGATED IN A NORMAL YEAR. | | | | Total number of State irrigation works. | IRRIGATION WORKS CONSTRUCTED BY THE STATES DURING THE PAST 30 YEARS. | |
|-----------------------------|----------------------------------|------------------|---------|---|---|--|--------|
| | From wells. | From tanks, etc. | Total. | Percentage on normal area annually cropped. | | Number of works. | Cost. |
| | Acres. | Acres. | Acres. | | | No. | Lakhs. |
| Ajmer-Merwara | 106,000 | 36,000 | 142,000 | 36 | 389 | ... | ... |
| Jaipur | 240,000 | 40,000 | 280,000 | 37 | 199 | 199 | 45 |
| Jodhpur | 244,000 | 123,000 | 367,000 | 6 | 32 | 32 | 20 |
| Bhartpur | 110,000 | 90,000 | 200,000 | 24 | 178 | 45 | 10 |
| Kotah | 48,000 | 17,000 | 65,000 | 10 | 44 | 44 | 8 |
| Kishengarh | 26,000 | 22,000 | 48,000 | 16 | 161 | 65 | 7 |
| Alwar | 129,000 | 64,000 | 193,000 | 11 | 103 | 22 | 6½ |
| Shahpura | 14,000 | 5,000 | 19,000 | 32 | 170 | ... | 5 |

* Excluding *jagir* or alienated lands.

578. *Ajmer-Merwara*.—Almost every available catchment in the districts of Ajmer and Merwara is utilized to its full extent for the storage of water by the numerous tanks, which, with few exceptions, were all made more than half a century ago under the directions of Colonels Hall and Dixon. Lying, as these districts do, on one of the main watersheds of India, both the tanks and the wells are dependent for their supplies entirely upon the local rainfall. There are no large rivers to feed the tanks, nor permanent currents of underground percolation to feed the wells. The extent to which the irrigated areas fluctuate with the rainfall is well exemplified by the following figures for very recent years:—

| Year. | Rainfall. | ACRES IRRIGATED. | | |
|---------------------|-----------|------------------|-------------|--------------|
| | | From tanks. | From wells. | Total acres. |
| | | Acres. | Acres. | Acres. |
| 1897-98 | 22·7 | 38,321 | 107,677 | 145,998 |
| 1898-99 | 12·35 | 25,592 | 93,486 | 119,078 |
| 1899-1900 | 6·64 | 13,421 | 43,776 | 57,197 |

There are four classes of tanks. On class I the area irrigated is assessed each year at certain rates which vary with the crop grown. The lands irrigated from class II pay at rates which vary in proportion to the area irrigated and, when the supply for the spring crop runs short, in proportion to the number of waterings. This variable system of assessment is said to work very satisfactorily. Tanks of class III pay an assessment fixed for a number of years. These three classes of tanks are maintained by Government. Those in class IV pay a fixed assessment, but are repaired by the villagers. The tanks are credited also with a share of the revenue assessed on wells whose supply they assist in maintaining. After special inquiry the share of the well-revenue creditable to the tanks was fixed at Rs. 35,799. Except in years of drought, when the receipts sometimes fail to cover the working expenses, the works return over 3 per cent. on their capital cost of about 25 lakhs. The revenue assessment upon which the credit to the tanks depends is, however, very light.

579. *Jaipur*.—During the past 30 years the enlightened rulers of the Jaipur State have steadily devoted a considerable annual sum to the construction of irrigation works. Carried out under the able supervision of Colonel Sir

Swinton Jacob, these works have proved of the greatest benefit both to the rulers and the people. The accounts of the works show only the revenue and expenditure for each year; there are no separate capital accounts. The expenditure shown includes the cost of the supervising establishment or the whole cost of collecting the revenue. We have, however, been furnished with figures but it does not include the cost of the capital outlay and the cost of annual repairs, from which we have been able to determine approximately the net revenue for each of the past ten years, and the capital outlay to the end of each year, in the case of 142 works which were completed before 1896. We find that the works have cost on the average Rs. 124 per acre or 4.92 per cent. on the capital cost, averages Rs. 7.93 per acre, and the average working expenses Rs. 1.83 per acre; leaving a net return of Rs. 6.1 per acre irrigated. The rate of gross revenue credited to the State's share of the produce from all lands newly brought under cultivation by the works. It is understood that, beyond the water-rate, no credit is given to the works for the increased outturn on old cultivation or for the benefit derived from them by the adjoining wells; on the other hand, no deduction is made for any increase in cultivation that might have taken place in the absence of the tank. In addition to providing funds for the construction of large irrigation works, the Durbar have been liberal in advancing money to private persons for the construction of wells. During the recent famine advances to the amount of three lakhs were given free of interest, of which about one-fourth was for wells.

580. *Jodhpur*.—There are but few tanks in Jodhpur and but few sites suitable for making them. The six tanks made within the last 20 years, at a cost of 15 lakhs, irrigate 15,000 acres in a favourable year. They receive no water at all in a dry year, but their effect in raising the level and sweetening the water of the wells is said to extend for many miles. Along the base of the Aravallis and in the vicinity of the Luni river and its branches, wells are extensively used. There are 54,000 wells in the State and, wherever water is found at a reasonable depth, there are said to be now a sufficient number. In the sandy plain to the north of the Luni the subsoil water is at a depth of 300 feet, and in all this extensive tract there is practically no irrigation. The State employs a competent Engineer, and the Durbar and the people seem to have spared no efforts in making the best use of such scanty facilities for irrigation as their country affords.

581. *Kishengarh*.—More than half the total cultivated area of Kishengarh is said to be irrigated in a year of normal rainfall, but in the recent prolonged drought the tanks and wells appear to have failed to a greater extent even than in the adjoining district of Ajmer. Two-thirds of the whole catchment area of the State is already provided with tanks. Territorial difficulties have been the chief obstacle to the utilization of the remainder. In view of the extent to which the manufacture of salt from the Sambhar lake depends upon a sufficient supply of water, the Government of India have prohibited the construction of new or the extension of existing storage works on any of the feeder streams of the lake, whether in British territory or in Native States. One of the most important of these feeders is the Rupnagar river, which, rising in the hills near Ajmer, traverses and drains the northern and hilly portion of Kishengarh. At present there is a difference of opinion as to the extent to which the supply of water in the lake is likely to be interfered with by the works which the State proposes to construct; and it is difficult to form a definite opinion in the absence of careful observations, extending over a number of years, of the rainfall on the catchment and of the resulting flow at various points along the course of the river. Observations of this kind are now being made, but the records extend back only to July 1901. Mr. Manners-Smith, Superintending Engineer, stated before us that one filling of the four tanks proposed in the Rupnagar valley, three of which are in Kishengarh, would raise the surface of the lake by only $1\frac{1}{2}$ inches, the area of the lake being 90 square miles; but pending the investigation now in progress, we have not thought it necessary to go into the details of his calculations. For the same reason we have also refrained from considering whether any deficiency in the salt supply that

might be caused by the construction of the proposed works, could not be met by improved arrangements for utilizing, more effectively and scientifically than is done at present, the water which is allowed to spread over the whole surface of the lake.

582. *Bhartpur*.—In Bhartpur, out of one million acres available for cultivation 75 per cent. is cultivated, and of the cultivated area 24 per cent. is irrigated annually. The State is therefore fairly well protected by irrigation. During the past five or six years, a great deal of good work has been done in constructing new and repairing old irrigation works. By an expenditure of slightly over 10 lakhs, the area annually irrigated by the State's works has been increased by over 50,000 acres. The works, besides being of great benefit to the cultivator, are a source of considerable profit to the State; for they yield annually Rs. 40,000 in water-rates, and are said to have increased the annual land revenue by $2\frac{1}{2}$ lakhs during the past six years. The country affords unusual facilities for irrigation, and the works are of a simple and inexpensive character. They consist chiefly of embankments or *bands* carried along a contour or across a shallow depression, with the object either of impounding and distributing spill waters from neighbouring torrents, or of impounding the surface flow from local catchments. The country is too flat to admit of any prolonged storage of the water. There is in fact only one tank in the State in which water is kept in store after the sowing of the winter crops. The main object of the *bands* is to submerge the land above them, so as to fertilize the soil by the deposited silt and saturate it for the autumn sowings. The land being flat a low bank floods a large area. The Ajan Bund, an earthen bank 12 miles long, intercepts the spills of the Banganga river and submerges about 14 square miles of country, the depth of water being nowhere more than 10 feet. When there is water to spare during the rains, or when after the rains it is being drawn off to prepare the land for sowing, it is utilized to saturate the lands below the embankment. Indirectly the works are of great utility in sweetening the often brackish subsoil water and in maintaining the supply of the wells.

583. In *Shahpura* out of 60,000 acres under crops, about 20,000 acres are irrigated in an ordinary year—half from wells and half from tanks. But in a dry year the tanks fail completely; while, if the drought be prolonged over a series of years, the wells water only about one-fourth of their usual area. The tanks nevertheless are said to yield a substantial return on their cost, in years of ordinary rainfall.

584. *Alwar*.—In addition to the expenditure of five lakhs in constructing 22 new tanks, the Alwar Durbar have also spent over $2\frac{3}{4}$ lakhs within recent years in re-constructing and enlarging 40 old tanks. Irrigation has not been developed on many of the tanks, the people preferring to use their wells. The good the tanks do is mainly indirect, by sustaining the subsoil water-level. In many parts the configuration of the country is not suitable for storage—especially near the hills where the steep slopes would necessitate high and expensive dams. The valleys are for the most part already occupied by wells; the revenue from which is said to be far higher than that obtainable from tanks.

585. *Kotah*.—A rainfall that seldom fails, a fertile black soil, and, until recently, a supposed immunity from famine, form a combination little likely to lead to the construction of irrigation works. Such are the conditions in Kotah. Nevertheless there are signs that the need for irrigation had been felt in that State, from time to time, even before the recent famine—the first of which there is any record in this favoured country. Small tanks, about 400 in number, are scattered over the land. These are said to have been made in the first instance for irrigation, though they are not now used for that purpose, their beds only being cultivated. During the past 20 years the State has advanced 13 lakhs for the construction of wells and field embankments. The number of wells now in existence is sufficient to irrigate over 36,000 acres in a dry year; and there are besides six fairly large works which have been constructed by the

Durbar during the past 23 years at a cost of about five lakhs. These irrigate 9,000 acres and are said to bring in a substantial profit to the State.

586. *Bikaner*.—In constructing the Ghaggar Canals and a few smaller works the Bikaner Durbar have done almost all that it was possible for them to do towards developing irrigation in this ill-watered State. On the Ghaggar Canals which were made during the famine of 1896-97 in co-operation with the Punjab Government, the State incurred an expenditure of over 2½ lakhs. The canals depend for their supply on heavy rainfall in the hills, and in almost every year since the works were made, the climatic conditions have been unfavourable. According to a statement supplied by the Dewan of the State the works have led to a total increase in revenue of Rs. 20,000 per annum.

587. *Other States*.—In the remaining States the irrigation is almost entirely from wells, and the proportion which the irrigated bears to the cultivated area varies from about 23 per cent. in *Dholpur*, to 18 in *Sirohi*, 13 in *Tonk* and *Bundi*, and 9 in *Parbhani*. No statistics are available to show the extent of cultivation and irrigation in the 14,220 square miles which are comprised in the State of *Mewar*. There are in this State numberless tanks varying in size from the Jai Samand, one of the largest artificial lakes in the world, to the small tank at which the cattle of the village are watered. They are, however, but little used for irrigation; even the great Jai Samand, with a waterspread of 21 square miles, does not protect more than a few thousand acres.

588. While this report has been going through the press we have received some interesting notes on proposed irrigation works in *Dholpur* by Sir Swinton Jacob who has carefully inspected this State. He writes—

Nature could not have arranged better for the interests of *Dholpur*. If only good use is made of the opportunities afforded, enough water falls at the highest part to irrigate the greater part of the State and make it absolutely safe against famine.

Sir Swinton has examined four sites selected by Mr. Thorpe, the State Engineer, where it is estimated that water might be stored sufficient for the irrigation of about 75,000 acres. He recommends that the most promising of these schemes should be carried out at once.

(iii).—*Scope for further extensions of State irrigation works.*

589. *Irrigation cannot afford complete protection*.—To protect Rajputana—or any large portion of it—absolutely against famine, by means of irrigation works, is an impossibility; for there is no unfailing source of supply such as the glaciers of the Himalayas or the ghâts of Western India afford. It has indeed been suggested that the waters of the Sutlej and Bias could be diverted from the Punjab to Rajputana; but according to the levels which have been laid before us, to which reference has been made in the Punjab Chapter, the only portion of the province that could be commanded from below the junction of those two rivers is a comparatively small tract in the extreme north-western corner of the Bikaner desert. And even if the Punjab could spare the water and the soil of the desert were found to be suitable for irrigation, the introduction of a canal into this outlying tract, though of great benefit to a portion of Bikaner, would afford no protection to the rest of Rajputana from which it is divided by 200 miles of desert. This relatively insignificant area in the extreme north-west, and another small tract where the Chambal river traverses the opposite corner of the province, are no doubt within reach of perennial sources of supply; but, speaking generally, Rajputana is dependent for its irrigation upon local rainfall. All available means of irrigation therefore fail under such conditions as have prevailed of late years; wells for the most part yield less than half their usual supplies; many dry up altogether; and all works of surface storage, save the very largest, fail almost completely.

590. But though the conditions render it impossible for irrigation to afford full and complete protection to Rajputana, much can be done in the way of partial protection. In most years a good deal, and in ordinary years an

immense deal, of water now runs to waste. It is not always possible to utilize it at any point in each State through which it passes; for the rivers and streams sometimes run through impassably deep ravines or through uncultivable jungle. But in the main, wherever the rainfall is sufficient to cause surface flow, the configuration of the country lends itself to the storage of water; and with quite insignificant exceptions the soil, when cultivable, is suitable for irrigation. The main problem to be solved then is to utilize to the utmost possible extent the water that annually falls within the province; and the example which has been set in Jaipur shows how much can be done in this direction.

591. *Scope for extensions and improvements. Territorial difficulties.*—In the districts of Ajmer and Merwara the catchments are, as we have said, already almost fully occupied, and, in some of the States also, there is not much room for new works. But both in British territory and the States, the existing works were, with some recent exceptions, built without expert assistance or any proper surveys, and much money might be spent in improving them. Colonel Jacob's experience in Jaipur shows what can be done even in the case of existing tanks to improve and extend the irrigation by properly surveying and reconstructing them on sound principles, and by aligning and regrading the irrigation channels. In some of the States, however, no attempt has been made to utilize the water that now flows useless to the sea, and in perhaps most of them there are sites where new large works could be constructed with advantage. As yet, although projects have been prepared from time to time, no practical attempt has been made to utilize the larger projects more than one State is concerned. In the case of many of the principal rivers of Rajputana. Sometimes a tank that will irrigate the lands of one State will, if constructed on the most suitable site, submerge the lands of another. In some of these cases the difficulties may be found insuperable, and for the best possible scheme some less suitable one will have to be substituted. But in many cases the friendly and disinterested arbitrament of the water, should avail to procure skill necessary to effect a proper division of the water, and the engineering settlements such as have already been arrived at, in a few cases, by friendly agreements between the States concerned; and, at least, no scheme should be abandoned for a less advantageous one until strenuous efforts have been made, and until the persuasive influence of the paramount power has been exercised to the full.

592. *Necessity for a more detailed and systematic survey.*—At present, however, we are ignorant of the exact capabilities of the country, for the storage of the surface water or of the manner in which they can best be made use of; and the first thing needed is to collect and record this information. A good deal has already been done during the past few years. Where the State employs a competent Engineer useful projects have been prepared, some of which have already been carried out or are in progress. In other States an Engineer, lent and paid by the Supreme Government, was employed in a similar manner for some months previous to our arrival in Rajputana, and on our recommendation the Government of India sanctioned the retention of his services until he had completed his investigations. The lists of projects which were laid before us—most of them in the rough or preliminary stage—include 276 separate works, estimated to cost in the aggregate 139 lakhs and to irrigate over 300,000 acres.

593. These projects, or as many of them as have been drawn up under expert advice, will be invaluable for relief purposes should famine recur. We recommended that those which had been proposed by the Government Engineer should be completed at once. They consist generally of those schemes which appeared, upon a cursory examination of the country, to be the most promising. But as we pointed out in a letter addressed to the Government of India on the completion of our investigations in Rajputana "if the maxim that it is wrong to allow a drop of water to run to waste in Rajputana is to be acted on to the fullest possible extent something more than this is wanted. What has already been done in a somewhat spasmodic manner and

hurriedly. What is now wanted is the *systematic* examination of Rajputana as a whole, based upon its physical features rather than upon its political divisions, to which latter regard would be paid only so far as is necessary to secure the rights in water of the several States. Each catchment should be taken up in turn and an irrigation reconnaissance made of it from its head downwards. Such a reconnaissance would enable the Engineers to say where dams can best be placed or water stored. The more detailed surveys upon which plans and estimates are to be based should follow in due course, though all of them need not necessarily be undertaken at once. It will be sufficient to keep always in readiness such detailed schemes as will afford an ample programme for relief should famine again occur." We may add that, in designing storage reservoirs for Rajputana as well as for other parts of India, we think it preferable to err on the side of making them too large, rather than too small. We believe that in general the capacity of reservoirs has been calculated with regard to the mean rainfall of the catchment basin. In exceptionally heavy rain storms, therefore, a large volume of water passes over the waste-weir which might have proved of great value had it been retained in the reservoir. It may be said that money is merely wasted if the tank is made so large as only to fill once in ten years, but the water stored up in that year may well be worth the money spent in storing it.

594. *Surveys, plans, and estimates should invariably be printed.*—And here we think it necessary to say that surveys, plans, and papers connected with such projects should invariably be put into print. We have had evidence, only in too many instances, both in Rajputana and elsewhere, of the loss of valuable plans and estimates. The labour and money wasted in one such case would pay for the printing of many sets.

595. *Consulting Engineer for Irrigation in Rajputana.*—Where the State already entertains a competent Engineer, he can conduct the reconnaissance and detailed survey. To meet the case of the other, and for the most part smaller States, we recommended, in the letter from which we have just quoted, that the Government Engineer already employed in completing the preliminary projects should be retained for the purpose. "But," we added, "to secure success some supervising agency is required; otherwise the Engineers of the different States may plan to utilize the same water. Moreover, some of the schemes—not many, but mostly large ones—will require the co-operation of several States, and finally some of the State Engineers will be glad of supervision and assistance." On these considerations we suggested the appointment of a Consulting Engineer for Irrigation in Rajputana, and that the States should be asked to allow their Engineers to consult him. He would then practically direct the whole survey. We suggested that the Government of India should pay the Consulting Engineer and also the Engineers for the smaller States. We learn with satisfaction that action has already been taken to give effect to these recommendations, and that the direction of the surveys is now in the competent hands of Sir Swinton Jacob.

596. *Assistance required by the States.*—Many of the States are just now in financial difficulties and may not have money to spare immediately, even for irrigation projects however promising. But the general survey and even the preparation of the plans and estimates commits them to nothing. As their finances improve they will probably be glad to take up some of the most promising schemes as productive works. Some of them, it is understood, are even now ready to borrow for this purpose, if the Government of India will lend the money; and we strongly recommend that all reasonable encouragement may be afforded in this direction. In any case, when the next famine comes, the existence of the projects in question will ensure relief labour being employed to the best advantage. All that is possible will have been done to help the States and they will know exactly what is feasible and advisable. But it will not be enough to get the schemes drawn up and placed on record. Constant encouragement and stimulation will be needed by some of the States at least, if any real progress is to be made. And to lead them on to renewed efforts, a very careful selection should be made of the schemes.

first taken in hand; so as to ensure a fair return while not committing the State to too large an expenditure.

597. *Difficulties in dealing with Jagirs.*—The existence of very large *jagir* areas in most of the Rajputana States constitutes a very real obstacle to the extension of irrigation. In some of the States water is given to *jagir* lands, which happen to fall within the *khalsa* area commanded by a tank, on payment of an enhanced—often double—water-rate. But in the case of continuous *jagir* tracts, which form a large proportion of the area of some of the States, the only way in which the Durbar can obtain a return for a work that it may wish to construct is by special agreement with the *jagirdars*; and the latter are usually jealous of State interference in their domains. On the other hand, they are not sufficiently enterprising and often not sufficiently wealthy to construct such works themselves. Signs are not wholly wanting that the pressure of the recent famine has operated to diminish this difficulty, but as a rule the first advance will have to be made in the *khalsa* areas. As the protective and remunerative nature of irrigation works becomes more apparent, it may be hoped that in time they will be extended to *jagir* areas also; but meanwhile cases will doubtless arise in which a Durbar will hesitate to undertake an important and promising work, merely because the *jagir* portion of the irrigable area is so considerable that if no return is to be received from it the work will no longer be productive. We hope, however, that when serious difficulties of the kind occur, it may often be possible for the Political Officers to bring about such an arrangement as will remove them.

(iv).—*Private irrigation works.*

598. *Well irrigation.*—From the figures given in paragraphs 577 and 587, it is evident that in some of the States irrigation from wells has attained large dimensions, while, in almost every State, it exceeds that from all other sources. As the cycle of scanty rainfall through which Rajputana has recently passed has been of unprecedented duration, so has the effect upon the subsoil water exceeded all previous experience. In 51 villages of Tonk, out of 645 wells examined in 1901, 402 were absolutely dry, while the rest were barely working. Generally speaking, the water level throughout the province sank from 10 to 20 feet, while the irrigated area diminished to about one-third of the normal. But the process was a gradual one; during the first year of drought the wells were scarcely affected, and on the whole they proved a real and valuable protection. In parts of Dholpur, it is interesting to note, there appears to be an underground supply of an artesian nature; in one well a strong spring of water was found at a depth of 120 to 150 feet which rose to within 60 feet of the surface.

599. *Small tanks.*—We have already referred to the numerous small tanks which exist in so many of the States, and have shown that even the smallest of these is not to be despised; at the least it stops water that would otherwise flow to waste, and allows it to percolate into the subsoil. In almost every State, but especially in those of the central plateau, there are large numbers of such tanks. In Mewar they were made, it is said, in by-gone days from pious or charitable motives, to afford a supply of drinking water for men and cattle; and there is now a prejudice against using the water for irrigation, or in any way that would result in pecuniary advantage. But whether used for irrigation or not, these tanks are now for the most part neglected and out of repair. It is curious to note how in this respect they have been affected by the substitution of a fixed cash assessment for revenue taken in kind. In one State at least it was the custom, when the produce of a crop was being divided, to set apart a small share for the upkeep of the tank. Now that a cash assessment has been substituted, the burden falls upon the village *malbah* and the tank is accordingly neglected. In Tonk, where the substitution has been made in the *khalsa* area only, we were told that the tanks in the *jagir* areas are in markedly better repair than in the *khalsa*. It is clear that the system of payment in kind secures to the improver a substantial share of the profits of his improvement, and gives the owner of the tank a direct interest in so regulating the distribution of water as to secure the greatest possible economy.

600. *Field embankments, etc.*—There are many subsidiary forms of irrigation works, the construction of which should be encouraged. In Bhartpur the larger *bunds* which have been so successful in protecting the country can be imitated by the cultivators on a small scale. In Dholpur small banks across minor drainage lines have been successful in holding up moisture, in collecting silt and in preventing erosion; and in Kishengarh the embanking of fields has been found a valuable means of protection. In parts of Tonk small irrigation cuts from streams are largely made use of. In the systematic survey which we recommend, these minor works should not be neglected, and the importance of prosecuting them as widely as possible wherever famine labour is available should be impressed upon the States.

601. *Measures for stimulating the construction of private irrigation works.*—Advances for well sinking have been given liberally and taken freely in some of the States, and in most further large sums could probably be given out with advantage. The rate of interest charged is generally 6 per cent. while in some States (Alwar and Bhartpur) the loans are advanced free of interest. But probably the most serious defect in the encouragement afforded to private enterprise in Rajputana is the absence of any system of exemption from wet assessment, beyond that afforded in many States by a settlement for a fixed term. So far as we have information, the period of exemption is short—from five to seven years; but, as might be expected, recovery is more elastic and less rigid than in British territory. In Kishengarh, the State's share of the produce of a field irrigated by a new irrigation work is reduced, one-tenth only being taken in the first year, one-ninth in the second, and so on until the normal one-third is reached after 8 years. This is not much more liberal than a total exemption for six or seven years, and may be less liberal than the exemption afforded in British territory; but, when coupled with liberal rules for *takavi* advances, it appears to have been an attractive inducement to private enterprise. We are of opinion that the introduction of such a system, or of a fixed period of exemption, would lead in many of the States to a substantial increase of the area protected by irrigation. In some States the difficulties attending the construction of wells are considerable, and help from trial borings would be advisable.

(v).—*Famine works and programmes.*

602. *Ajmer-Merwara.*—In the recent famine, the expenditure of 29 lakhs on relief works in Ajmer-Merwara was chiefly incurred on the construction and repair of roads and the collection of road-metal. Eleven lakhs were, however, spent on works for the storage of water—chiefly on constructing 16 new tanks, of which 11 were completed and 5 left unfinished. Work on the Outra tank was stopped, as it was feared that it might interfere with the supply of water to the Sambhar Salt Works. Three of the other uncompleted works will now be completed, and one held over until the recurrence of famine.

603. *Native States.*—Out of a total of 69 lakhs spent on relief works in the Native States, 41 lakhs were spent on irrigation works, 20 lakhs on railways, and the balance on roads and miscellaneous works. The expenditure on irrigation works was incurred on a number of new works—many of which have been or are now being completed—and on repairing and improving existing tanks. The works selected appear to have been all of real utility; but, except in a few States, there were no lists of suitable schemes ready, and in many cases there were no officials on the spot with the training or experience which would enable them to select the most suitable projects, to prepare detailed plans and estimates of the works, and to see that the works were properly constructed. The want of a programme of suitable works and of a trained establishment led, no doubt, to a considerable waste of money in many of the States. If effect be given to our recommendations (paragraph 533), the Darbars should be much better prepared, as regards their programmes of irrigation works, to meet the contingencies of another famine. Suitable employment, near their homes, will be made available for the people, who will thus be saved the trouble and

222

expense of moving into British territory where, as in Ajmer-Merwara, there is often very great difficulty in finding work even for the resident population.

SECTION II.—KATHIAWAR.

(i).—Local conditions; use and value of irrigation.

604. *Political Divisions.*—Out of 23,500 square miles comprised in the peninsula of Kathiawar, 1,320 square miles are included in the British district of Ahmedabad; another portion of the same size is in the State of Baroda; a few square miles in the south are in the possession of the Portuguese; and the remaining area is distributed among nearly 200 more or less independent chiefs and landowners.

605. *Physical features.*—Geologically Kathiawar is an outlying island of the Deccan trap series which has been joined to the main land by the silt deposits of rivers flowing into the gulfs of Cutch and Cambay. The surface of the country is generally undulating, but it is broken by numerous hills which form two very irregular ranges crossing the country from west to east in nearly parallel lines. The highest eminences are in the southern range where the Girnar, rises to 3,636 feet. These two ranges, and a high narrow hill, the connecting them, form the main watershed from which numerous rivers flow to every side in almost direct courses to the sea. But though none of the rivers is of great length, many of them attain a considerable size in the rainy season. Some of them are said to be perennial, but their supplies in the dry season are insignificant. The Bhádar in favourable years carries a considerable volume—averaging about 200 cusees—throughout the cold weather, but in years of scanty rainfall its supply entirely fails; in 1900 it was dry before the end of November. In all the numerous valleys and everywhere in proximity to the coast, the subsoil water is found fairly close to the surface. The water is generally sweet, but it is brackish in places, especially near the sea. Inland the supply fails partially or entirely in years of scanty rainfall.

606. *Soils and agriculture.*—The soil for the most part consists of the numerous varieties of black soil common to the trap formation. It overlies... generally a porous substratum, and in depth varies from five to ten feet or more in the fertile valleys, to a few inches in the hills where the trap shows on the surface over large areas. It is well suited for irrigation, but for irrigation to be fully effective, an exceptionally large number of waterings appears to be necessary. *Juar*—which is grown in all seasons of the year—*bajri*, cotton, and *til* are the principal rain crops; and wheat, hot-weather *juar*, cane, rice, and vegetables the principal irrigated crops.

607. *Rainfall.*—Round the coast the average annual rainfall varies from 19 or 20 inches on the north and west, to 25 inches in the extreme south, and 28 inches along the east coast. Inland it averages about 27 inches, excluding the higher portion of the north-east where it is said to reach 80 inches, and the alluvial plains to the south where the average is about 20 inches. From year to year the amount varies between wide limits; in 1878 the province received nearly three times, and in 1899 about one-fourth, the normal amount. The rainfall is practically confined to the period of the south-west monsoon, that is, from June to early in October.

608. *Famines.*—More than one of our witnesses assured us that, until recently, famine in Kathiawar was almost unknown. But this evidence is hardly borne out by the long record of famines given in the Gazetteer of the Province. In the eighteenth century three very severe famines are recorded: the first due to drought, and the second to excessive rainfall; of the third the cause is not stated. In addition there were seven years of distress and scarcity. Within the last century there are said to have been at least 14 years in which

the rainfall was so deficient as to lead to more or less severe distress. Of these, three were years of very severe famine. The famines of 1813 and 1877 were aggravated in each case by a subsequent year of excessive rainfall.

609. *Utility of irrigation.*—From this brief description of the province it is evident that, from our point of view, the conditions in Kathiawar resemble in many respects those in Rajputana. There are the same difficulties arising from the conflicting interests of various States; there is the same liability to severe drought, and, though no doubt in a less degree, the same liability to suffer from a partial failure of the rains. There is the same absence of large perennial rivers; the same, if not a greater, liability of the wells to fail in a year of scanty rainfall; and generally the same need for irrigation, and the same dependence upon local rainfall for all means of supplying it. The general prevalence in Kathiawar of moisture-retaining black soils renders irrigation unnecessary for the monsoon crops even in years of light rainfall, if the rain is favourably distributed throughout the season; and for the *rabi* crops in some parts of the province if the later rains are abundant. In all other respects the necessity for saving every drop of water that can be stored at a reasonable cost appears to be no less urgent in Kathiawar than it is in Rajputana. In years of ample rainfall the water can be utilized for the cultivation of spring and hot-weather crops; and when the rainfall, though sufficient in amount, is badly distributed throughout the season, it will nearly always be beneficial to the monsoon crops. In years of very scanty rainfall no doubt, here, as in Rajputana, all but the largest tanks will fail.

(ii).—*Existing State irrigation works.*

610. *Works constructed before the recent famine.*—Irrigation works of any considerable size were practically unknown in Kathiawar before the failure of the rains in 1899. Numerous wells were in existence, of which a large number had been constructed by the Chiefs and cultivators in 1877. But in the State of Porbandar alone does any attempt appear to have been made to construct an irrigation work on a fairly large scale. In 1895 that State undertook the construction of a weir and regulator across the Bhādar river. The works were completed during the famine at a total cost of over three lakhs. They supply water, for irrigation by lift, to about 12,000 acres of existing cultivation and will, it is hoped, bring under the plough about 30,000 acres of low lands now lying waste. The State officials appear to have no doubt as to the remunerative nature of the works.

611. *State wells.*—The wells which in many cases have been constructed at the cost of the States are said to yield a handsome return on their cost. Our evidence as to the average cost of a well is very conflicting, but an ordinary masonry well, 30 to 40 feet deep, from which four or five acres are irrigated annually, is said to cost from Rs. 300 to Rs. 600. In some of the States the cost is recovered by the increase in the State's share of the produce, which is taken in kind. In others the State advances the cost of the well by instalments as the work proceeds, and the cultivator, after he has made the well, which is the property of the State, pays annually Rs. 5 an acre on the area which it is capable of irrigating, whether the land is irrigated or not; or a lump sum of Rs. 20; or in some cases an annual payment equal to 10 per cent. of the advance. In Junagadh 15,000 wells constructed by the State are said to yield an annual return of 5 per cent. on their cost, and in other States an even larger return is claimed.

612. *Storage works constructed during the famine.*—During the recent famine, relief labour was largely employed in most of the States on the construction of irrigation works. Over 28 lakhs were spent on 64 storage tanks of which 38 were completed; and about 18½ lakhs in constructing 2,335 wells. Of the new storage tanks the more important were designed by and constructed under the able supervision of Mr. Marson, Executive Engineer, who was lent to a number of the States. The information laid before us does not enable us to show, with any approach to accuracy, the extent to which the

irrigated area of the country will be increased by all these works, but, at a rough estimate, if they are fully utilized, they will perhaps irrigate 50,000 acres annually. It is too early to say what return may be expected from the new tanks. Few, if any of them, are yet in proper working order and the people have not yet learned to make the best use of the water. But judging from the rates paid for water lifted from wells and from those paid on a few existing tanks, we see no reason why storage works in Kathiawar should not be at least as profitable as those in Rajputana. On the Lalpuri tank near Rajkot the rates vary from Rs. 2 for ordinary monsoon crops to Rs. 6 for wheat and Rs. 25 for sugar-cane. This tank is, no doubt, situated close to an exceptionally good market, but in other States Rs. 6 for wheat appears to be the usual charge, and the State secures in addition its share of the increased produce. When the time comes for considering the results derived from the works recently constructed, it will be necessary to make allowance for the conditions under which they were designed and carried out. In most cases the designs were of necessity hurriedly prepared; the site was often selected more with a view to its convenience as a famine work than to its being the best for a storage work; and the work was constructed by famine labour and cost at least 30 to 40 per cent. in excess of what it would have cost if carried out by ordinary labour.

(iii).—*Scope for further extensions of State irrigation works.*

613. *Necessity for storage works.*—The sole source of supply being a local rainfall which is practically confined to a few months of the year, an extensive system of storage works is the only means of increasing the irrigated area of Kathiawar to anything like the extent required for protection against famine. With few exceptions the rivers are in flow only during the monsoon months, when water is least required, so that any extensive system of canals is out of the question. There may be scope on one or two of the larger rivers for constructing works similar to those recently made on the Bhādar in Porbandar; and the monsoon supplies of even the smaller rivers might perhaps be utilized for *kharif* cultivation, especially where the soil is suited to rice. No doubt also there is still room for a considerable increase in the utilization by wells of that portion of the supply which percolates into the subsoil; but at the best the area that can be irrigated in this way will fall far short of the protective requirements of the province. On the whole, it seems probable that, as in Rajputana, the total amount of protection that can be afforded by all possible forms of irrigation works will still be inadequate. Mr. Mawson estimates that in no case would it be possible to protect more than one-fifth of the cultivation by means of irrigation works. On the information at present available it would be impossible to check this estimate, but we have no doubt that in the storage of water lies the only means of making any considerable addition to the present insufficient means of irrigation in many parts of the province.

614. *Facilities for storage works.*—The general formation of the country is well adapted to the construction of tanks, consisting as it does of hills that attract a heavy monsoon rainfall and of fertile valleys or plains whose soils are on the whole well suited for irrigation. But the catchments are often so small that in a year of drought the tanks may not fill and even where the catchments are large, it may often be difficult to find suitable sites for tanks on a large scale. The population also is scanty and unaccustomed to wet cultivation; and, though in many parts *rabi* crops are seldom possible without irrigation, a light rainfall if fairly well distributed secures a fine autumn harvest. Thus, though the people are at present keen for the extension of irrigation, we do not feel at all certain that on the return of more favourable seasons, they will not revert to their former less laborious practice.

615. *Political difficulties.*—The main obstacles to the extension of tank irrigation are, however, political. All the difficulties that exist in Rajputana are here greatly intensified by the extreme smallness of most of the States, and by the manner in which their territories are intermingled. In many parts, where the physical conditions are favourable, it is almost impossible to find sites for tanks of which both the submerged and the irrigated areas would

lie in the same State. The borders of many of the streams are fringed with wells, the water level in which would be injuriously affected by holding up the cold-weather supply higher up the stream, and distribution of the water among the various States interested is often hardly possible. Again, the feudal tenure-holders, who correspond with the *jagirdars* of Rajputana, have been invested with an even greater degree of independence than they have attained in that province; while large assignments of land revenue, generally in the form of shares of villages to the *Girásids* or descendants of old free-booters, hamper all revenue administration, since the consent of all the sharers has to be obtained to any measure that may affect the value of their shares. Broadly speaking, nothing in the way of an irrigation work on anything like a considerable scale, is possible without the co-operation of many of the States, while even the smallest works are likely to be objected to by the States lower down the catchment.

616. But the very conditions that make co-operation difficult will justify the exercise of such political pressure as may be necessary to ensure the utilization of the available water-supply to the best advantage of all. Whatever objections may be raised during the progress of the negotiations the Chiefs will, we have no doubt, be glad in the end to have been persuaded to their benefit. The Porbandar State affords two conspicuous instances of the necessity for some such control. It lies at the mouth of the Bhádar river, the water of which, as already noted, has been utilized with great success and at considerable expense. But that success depends wholly upon the cold-weather flow of the river not being interfered with since the flatness of the country renders the storage of a *rabi* supply impossible. At present there is nothing to prevent such interference. Again, some 40 years ago, the State of Jamnagar threw a weir across the Vartu river which runs through Porbandar. Only a small portion of the supply was thus held up and utilized; the remainder has been diverted from its natural channel so that it passes uselessly to the sea. We were informed that the matter had been in dispute for many years, but that no final adjudication had yet been made.

617. *Completion of unfinished famine tanks.*—Many of the tanks which were undertaken by famine labour during the recent famine are still unfinished. Others are so far completed that the people are irrigating from them; but they have been finished in a hurry, and upon most of them more or less further expenditure is desirable in order to secure the best returns for the money which has already been spent upon them. The first thing to be done is to arrange for this further expenditure and to complete such of the works as are worth completing. The amounts required are not likely to be large, but in many of the States, owing to the loss of revenue and the expenditure incurred during the recent famine, the exchequer is now empty. We think that in such cases the Government of India should, when necessary, assist the States in completing the works with loans upon moderate terms.

618. *Systematic survey of the country.*—No programme of new works can be proposed until a systematic survey of the country has been made similar to that recommended for Rajputana. For this work it will be necessary to depute a specially qualified officer for the investigation of projects in those States which have no engineers of their own. His salary and the cost of his subordinate establishment might, we think, be met from Imperial funds. It would be his duty to make, in conjunction with the State engineers, a general survey of the irrigational possibilities of the entire province; to propose as many self-contained works for each State as may be possible, but at the same time to consider other schemes which may affect more than one State; and to propose the best means of utilizing the available supply of water with reference only to physical considerations, and not to territorial boundaries, due regard, however, being paid to the rights in the water of the several States concerned. To enable many of the States to undertake the works it may be necessary for Government to advance loans on liberal terms. But except when relief works are necessary we do not think that the States should be pressed to spend, at any rate borrowed money, upon extensive new works until they have seen whether the demand

for water on existing tanks stands the test of a cycle of normal years. It may be that the possibility of *rabi* cultivation will be sufficient to produce a constant demand; but in view of the character of the people we think it would be unwise to assume too readily that this will be the case. If the demand persists, tanks should be very remunerative at the water-rates now charged; but there is of course a possibility that it may be found necessary to reduce some of these rates when favourable seasons again become the rule.

(iv).—*Private irrigation works.*

619. *Private wells.*—A few small irrigation channels have been constructed by the cultivators in some of the States; with these exceptions the private irrigation works in Kathiawar consist solely of wells; and even of these, as we have said, a large proportion have been constructed by and are the property of the States. The facilities for the construction of wells vary greatly in different parts of the province, the subsoil water being only eight to ten feet deep in many places near the coast, and 30 feet to 35 feet over a great portion of the area. Their construction offers no special difficulties and the sites are usually selected by local water-diviners whose judgment is said to be unerring. But as usual in black cotton soil the water-supply is uncertain both in quality and quantity, and in many States only a very limited area can be protected in this manner. When wells are constructed by the State, the agency of the cultivator and his home labour are largely employed. The practice seems to be to advance material and capital and to leave to the cultivator, under supervision of the local officers, the execution of all work which does not involve the employment of highly skilled labour. In return for State aid the cultivator pays either in kind or by the usual share of the produce, which is of course increased considerably in consequence of the irrigation, or by an addition to his cash assessment usually calculated to correspond with this increase. We are unable to judge how far this system has succeeded, but it has better chances of success in those States which are small, and in which therefore the authorities are able to get in close touch with the cultivators, whom they can influence in many ways not open to the officials of the large Government Departments of British India. We have not been able to procure statistics showing the extent of well-irrigation from wells in the various States, but the number of wells in the coast districts is large; there are 14,725 in Junagadh, 13,794 in Bhavnagar, and 4,340 in Porbandar. Considering the character of the people, who are for the most part averse from the additional labour involved, any extension of well-irrigation must probably be slow, but there is no reason why it should not eventually be very considerable. There are undoubtedly extensive tracts suited to construct them and it rests with the States to stimulate the construction of wells in them by advances from the Imperial Government under such safeguards as may be required to ensure the expenditure of the money lent on the objects for which it is borrowed. A considerable number of wells were begun in the famine, but in many cases they were never finished, work being discontinued as soon as rock or hard soil was reached. As in the case of other famine works the States should be urged to complete, or to advance further money for the completion of such of them as involve slight additional expenditure and have a fair certainty of being used. We gather that the wells in Kathiawar failed materially in the first year of drought than was the case either in Rajputana or in Gujerat; and, as tank construction extends, well construction should be pressed on hand in hand with it, the former greatly increasing the security afforded by the latter.

(v).—*Famine works and programmes.*

620. *Employment of famine labour.*—The works on which famine labour was employed during the recent famine consisted mainly of the irrigation works to which we have already referred, recommending their completion in certain cases; and, with regard to providing suitable works for any future famine, the

recommendations which we have made in paragraph 618 should result in the preparation of a programme of really useful works. Our recommendation to proceed tentatively in the construction of new works in ordinary years does not apply to a year of famine, when the works should be pushed on to the utmost extent necessary for the employment of famine labour; and at the end of the famine, those works should be finished which will repay the cost of their completion, irrespective of the expenditure already incurred.

621. *Prevention of emigration.*—Severe distress in Kathiawar leads to wholesale immigration of starving people into the adjoining British districts of Gujerat, and if simultaneously there is famine in those districts, the immigration gives rise to most serious complications and difficulties. On this ground alone we think that Government would be justified in assisting the States in the preparation of a complete programme of relief works and in urging that the works be put in hand on the first occurrence of a famine; dealing liberally, at the same time, in the matter of advances to the less wealthy States. We would observe also that there appears to be a much wider field for the useful employment of emigrants from Kathiawar on canal extensions and clearances in Sind than in Gujerat where their presence causes so much embarrassment. Immigration into Sind would be much facilitated by the construction of the proposed railway for connecting Kathiawar with Lower Sind which appears to us, on this account, to be a project deserving favourable consideration.

SECTION III.—MYSORE (AND COORG).

(i).—*Local conditions; use and value of irrigation.*

622. *Physical features.*—The State of Mysore, with a population numbering 5,419,923, covers an area of 29,417 square miles, of which about one-third, known as the 'Malnad,' lies on the eastern slopes of the Western Ghats; the remainder, known as the 'Maidan,' is a rolling plateau lying in the angle formed by the Eastern and Western Ghats which meet in the Nilgiri hills in the southern corner of the province. The general elevation of the plateau varies from about 2,000 feet above sea-level in the north and south, to about 3,000 feet along the central watershed which, running roughly east and west, separates the basins of the Tungabhadra and Penner rivers on the north from those of the Cauvery, Ponniar, and Palar on the south. The surface of the country is generally undulating, but it is broken by numerous hills which form irregular ranges running roughly from north to south, and it is scored in many parts by deep ravines.

623. *Soils and agriculture.*—The prevailing soil is a red loam, formed chiefly of decomposed gneiss. Irrigation suits this soil and the cultivators readily take water for it, but here and there, especially in the district of Chitaldrug, there are tracts of black soil which they are very slow to irrigate even when water is available. Out of a total area of nearly 17½ million acres for which records are available, nearly one-half is uncultivable or under forest, seven million acres are cultivated, and the balance, about 1½ million acres, is cultivable waste. The gross area under crops in a normal year may be taken as 6,113,000 acres or rather more than 1.1 acres per head of population. Of this area 945,000 are irrigated, 105,000 from State canals, 540,000 from tanks, 70,000 from wells, and 230,000 from other sources. The staple crop is *ragi* (*Eleusine corocana*), the *marua* of Northern India, which forms more than half the total area of dry crop cultivation. It is sown soon after the commencement of the rains and reaped in November and December. From dry cultivation there is but one crop in the year, and there is practically no rotation of crops. Rice, gram, sugar-cane, and garden produce are the principal irrigated crops. Rice sown on the break of the rains is known as *Kartika*; that sown in December or January and reaped in May is known as *Vaishaka*. Both crops require constant waterings for five or six months at intervals of four or five days. Sugar-cane, of which about 30,000 acres are grown annually, requires water, at intervals of 15 or 20 days, for 10 or 11 months of the year. To prepare land for irrigation it has generally to be levelled

off and terraced at a cost to the landowner of Rs. 10 to Rs. 25 per acre. In the extremo east of the province the people prefer wet to dry cultivation. In the central portions, where the population is sparso and less enterprising, dry cultivation is preferred.

624. *Rainfall and famines.*—The province is so situated that it receives the rainfall of both monsoons. That from the south-west brings rain from the middle of May to about the middle of September and that from the north-east from September to about the middle of November. The amount received varies enormously according to the locality. At one point on the Western Ghats the annual average is said to exceed 350 inches, while at two of the recording stations in the Chitaldrug district it is barely 17½ inches. For the recording stations situated in the Ghats close to the western border, the average is over 140 inches; but the rainfall rapidly decreases as the clouds drift eastward, and at a distance of 30 miles from the border the average is only 3½ inches, while at 50 miles off it is only 25 inches. Eastward of this the average is about 28 inches in the south-eastern portion of the province, and about 22 inches in the north-eastern portion which, as a rule, receives only a scanty share of either monsoon.

625. Previous to 1876-77, there is no record in the history of the province of any considerable famine caused by drought alone. Famines had followed on the devastations of hostile armies, and partial failures of the rains had led to severe scarcities in 1824, 1833, and 1866; but these latter were of short duration, and until the failure of the rains of 1875, and the still more deficient rainfall of 1876, the province was looked upon as practically immune from very prolonged drought. In these two successive years it received only about half its average rainfall. The result was a famine which fell with appalling severity on the districts of Chitaldrug, Tumkur, Bangalore, and Kolar, and in fact on the whole two-thirds of the State lying east of a line drawn through the town of Mysore parallel to the Western Ghats. The province lost about one-fifth of its population; the treasury a year's revenue or over a million sterling; while the loss to the people in produce, cattle, and other property, was estimated at nearly 9¼ million sterling. Since then there has been no serious failure of the rains, but the rainfall has often been deficient or unfavourably distributed throughout the season.

626. *Value of irrigation.*—Experience, then, has shown that everywhere throughout the province save in a narrow strip of assured rainfall along the western border, irrigation is necessary as a protection against occasional famine and the vicissitudes of ordinary seasons; while throughout the whole province it is useful in affording employment to the agricultural classes in the interval between the reaping of the dry crops in December and the setting in of the rains in May. None of the more valuable crops, such as sugar-cane, garden produce, and the best qualities of rice, can be grown profitably without irrigation; and on an average the value of the produce of a single crop is said to be nearly quadrupled in ordinary years by an assured supply of river water, and increased thirty-fold in a year of drought. But perhaps the best index to the value of irrigation in Mysore will be found in the fact that though the irrigated lands comprise only about 15 per cent. of the whole occupied area, they pay about 40 per cent. of the total land revenue of the State.

(ii).—*Existing State irrigation works.*

627. *Classes of works.*—The conformation of the country, eminently adapted as it is for the construction of tanks, has been almost fully utilized for this purpose from time immemorial. Some new tanks have no doubt been constructed within recent years, but the majority are old works, the original cost of which is now not known. They are all classed as State irrigation works, with the exception of a small number situated in *inam* or alienated lands. There are in addition numerous canals or river channel works. Many of these have been improved or constructed by the State and nearly all are under State management. The State irrigation works may therefore be divided into two main classes: canals or river channels, and tanks.

628. *Canals or river channel works.*—The canals are small irrigating channels taking off from above rough stone or masonry dams thrown across one or other of the principal rivers. They run generally parallel to and at a short distance from the river's bank and irrigate only the intervening strip of land. They are fed either directly from the river or from tanks in which the water of the river is stored. The total length of channels is about 1,000 miles, and they irrigate annually upwards of 100,000 acres. They do not flow continuously throughout the year; they are shut off in December or January, and from that time until the commencement of the rains they are opened in rotation, for 7 or 8 days only in each month, for the irrigation of sugar-cane. But they receive a sufficient supply in all years for the crops protected by them, and the areas they commanded were unaffected even by the severe drought of 1876-77. All works of repair are carried out by Government except the clearance of weeds which is left to the cultivators. During the regular irrigating season the channels are worked and the distribution of the water is supervised by the revenue officials. But for half the year, during the dry weather while the annual repairs and silt clearances are in progress, most of the channels are controlled and their waters distributed by the Public Works Department.

629. The original cost of many of the channels is not known and there are no capital accounts of the works; but besides being of great protective value they are also undoubtedly remunerative, so far as the known expenditure incurred by the State is concerned. Since 1863-64 just over 40 lakhs, or say Rs. 40 per acre irrigated, have been spent on constructing new or improving old works. The total revenue dependent upon all the works is $6\frac{1}{2}$ lakhs or, say, Rs. 6 per acre; while they cost less than a lakh, or Re. 1 per acre, to maintain.

630. *Tanks.*—In the whole province of Mysore there are said to be 39,000 tanks, or one tank to every three-fourths of a square mile. Of these roughly 27,000 are State tanks, which irrigate in a normal year about 500,000 acres; 2,000 are private tanks irrigating about 40,000 acres; and the remaining 10,000 are mere ponds yielding no revenue. Many of the tanks, especially those in the Shimoga and Kadir districts, are fed by channels taking off above dams constructed in the beds of adjoining streams or rivers; but the majority are constructed across drainage depressions or streams and are fed directly by the rainfall over the catchment above. In almost every valley there is a chain or series of such tanks, one below the other and all discharging into a terminal tank. The embankments forming the tanks are, in nearly all cases, faced with a rough stone revetment having a slope of 1 to 1 or $1\frac{1}{2}$. Most of those from which there is direct irrigation are provided with masonry outlets, sluices, and escapes. Many however are not used for direct irrigation, but merely to maintain the water level of the wells in the valley below and these have no sluices.

631. *Classification and size of tanks.*—The tanks are classed according to the amount of land revenue dependent on them. All irrigated lands are assessed at a consolidated rate which includes the ordinary dry rate of about 8 annas to Re. 1 per acre, and a wet or water advantage rate which is said to vary from Rs. 2 to Rs. 4 for ordinary crops, to Rs. 9 and more for gardens. A tank is classed as a major tank if the lands under it, assessed as irrigated, yield over Rs. 300 in annual revenue; and as a minor tank if they yield Rs. 300 or less. Roughly major tanks are tanks which irrigate 80 acres or more.

632. There are in all 2,318 major tanks. The largest of those which have been completed is the Sulikere tank, in the Shimoga district, with a capacity of 3,118 million cubic feet. This work has proved a failure owing to its commanding black cotton soils which the people are reluctant to irrigate. The list supplied to us of the more important tanks contains only one other tank with a capacity of over 1,000 million cubic feet, and only 10 tanks in all with capacities of over 270 million cubic feet. This is not a fact to be regretted, for most of the tanks are dependent upon a local and uncertain rainfall and the remarks which we have already made (paragraph 160) with reference to the comparative advantages, under such conditions, of large and small tanks, are, we think, as applicable generally to Mysore as to the Deccan districts of Bombay; although in

Mysore, especially in the eastern parts, a tank of moderate size has no doubt this advantage over a number of small tanks of collectively the same capacity, that in years of good or ordinary rainfall it admits of a supply being held over for the cultivation of the *Vaishaka* crop. Besides securing a more valuable crop the cultivator is thereby enabled to grow his dry and wet crops at different seasons of the year, and can give to each his undivided attention.

633. *Distribution of water.*—The distribution of water is done by *nirgantis*, or hereditary watchmen, who are paid in kind by the cultivators. They open the sluices and let out the water under the orders of the village headmen. The system is said to work well in the case of small tanks, but to be the cause of many complaints and much waste of water in the case of larger tanks. Here, as elsewhere, the substitution of money payments for rent paid in kind has been to the detriment of irrigation. Formerly, when a portion of the produce went to Government and a portion to the rayats, it was to the interests of both, in a year of short rainfall, to see that the cultivation under a tank was limited to the volume of water available. Under the present system of assessment the State has not the same interest in limiting the extent of cultivation, and, in consequence, the sowings are said to be now often much larger than the supply in the tank can mature. On the other hand, one of our witnesses assured us that he knew of cases in which the tank being only half-full and the water not sufficient for all, no use had been made of it, as the cultivators could not agree amongst themselves regarding its distribution. We gathered that such cases are not numerous, but we have heard of similar instances in at least one British district.

634. *Restoration and repairs of tanks.*—The question of the repair and maintenance of tanks has evidently been the cause of as much trouble and anxiety to the Mysore Durbar as it has been for many years to the authorities in the adjoining Presidencies; and in this case also, judged by practical results, no satisfactory solution of the difficulty has yet been found. Under rules which were issued by the Chief Commissioner of Mysore in 1873, the village authorities were held responsible for the maintenance and upkeep of any tanks that were handed over to the rayats on or after that time. If afterwards it was found that a tank had not been kept up to the standard to which it had been brought when handed over, the rules directed that the work should be carried out by the district authorities and the cost recovered from the defaulters as a revenue demand. These rules are, it is said, still valid, but as a matter of fact they are seldom enforced. In 1885-86, a few years after the rendition of the province, what is called the minor tank system was introduced. Under that system minor tanks are restored and brought up to standard by the rayats working under the revenue authorities, the stone and masonry work being done by the Public Works Department. In the case of major tanks the whole work of restoration is carried out by the Public Works Department. As each tank, whether major or minor, is restored, it is handed over to the revenue authorities, who are expected to see that the rayats obey the rules of 1873. We do not know how many tanks have been repaired under this system; but since 1870-71 the total number restored, both major and minor, is said to be only 2,881, or at the rate of about 96 tanks per annum. Of these 1,305 are major tanks. In the case of minor tanks the initiative is apparently taken by the rayats. When they come forward and do the earthwork, the State repairs the masonry works. The number of tanks of this class which are annually restored appears to have increased considerably during recent years. In 1899 as many as 1,137 were dealt with. There are, however, still many thousands requiring restoration. But even after a tank has been restored the rayats, we are told, seldom make any effort to keep it up to standard, and there appear to be doubts on the part of some of the revenue officers as to the legality of enforcing the rules of 1873. Thus many even of the restored tanks are now gradually deteriorating.

635. We understand that a trial is being made of a new system under which all repairs are carried out by the State, the rayats' share being recovered in the form of an additional cess. There would, no doubt, be certain advantages in the introduction of such a system, if it is really impossible to enforce the

present rules. We are informed, however, that the whole question of the maintenance of the tanks is being fully considered by the responsible authorities, who recognize its enormous importance; and it may be hoped that, whatever rules are finally adopted, measures will be taken to give them practical effect. The only recommendation which we think it necessary to make is that arrangements should be made for the more frequent periodical overhauling of the minor tanks under professional supervision. These as well as the major tanks should be taken up in regular rotation and brought up to standard once in every 20 or 30 years, the rayats if necessary being compelled to do their share of the work or to pay for it if it is done by the State. For tanks in a series, and in red soil, thirty years is named as the period after which, owing to the deposit of silt, it becomes necessary to raise the weir and embankment by about a foot, so as to maintain the capacity of the tank. The period is said to be distinctly shorter in the black cotton soil tracts.

636. *Protective and financial results.*—Except in the case of a few works which have been recently constructed, there are no capital accounts for any of the tanks, nor has it been found possible to determine even roughly their capital cost. During the twenty years that have elapsed since the rendition of the State in 1881, the Durbar have spent 207 lakhs on irrigation works, of which apparently about 160 lakhs were devoted to tanks, but this includes all the outlay incurred on annual repairs and on the improvement of old works. There is a difficulty also in ascertaining the amount of revenue directly due to the works, as a separate water-rate is only assessed on lands irrigated from a new work, and then only until the expiry of the current settlement. In all other cases, the water rate is consolidated with the dry rate, and, as the extent of area assessed to irrigation is based on the average of good and bad years, the assessment is paid whether the land is irrigated or not, and even when no water is available for irrigation. It is therefore impossible to form any estimate of the returns yielded by the tanks, as a whole, compared with their capital cost. The few new tanks for which capital accounts are maintained, and which barely pay their working expenses, cannot be taken as typical examples, for all the best sites had already been occupied by the older works. More than half of the whole irrigated area, and about a fifth of the older works. In a dry year no question of their value as protective works. In a dry year no doubt many, and in a very dry year almost all, fail; but the good they do in ordinary years is of very great assistance to the cultivator in tiding over a bad year; and even in the worst year they assist in maintaining the level of the subsoil water. Three-fourths of the wells in the State are directly or indirectly dependent upon them. It is, in fact, no exaggeration to say, as one of our witnesses has said, that the tanks in Mysore are the very life of the people.

637. *Progress made since the famine of 1877.*—Before passing to the question of the scope which exists for the further extension of irrigation works, it is desirable to consider briefly in what respects Mysore is now better fitted than it was in 1875 to withstand a serious famine. The most important advantage gained lies no doubt in the improvement of the means of communication. During the famine there was but one short line of rail in the whole province—the branch line from Jalarpet terminating at Bangalore; its total length within the province being little more than 40 miles; and “upon the traffic carried along this single iron thread, throughout 1877, hung the lives of a million of souls.”* Every district in the province is now either traversed by or has its main town connected with a railway, and the total length of line within the province has been increased to over 450 miles. In addition to the extension of railways, more than 1,000 miles of new roads have been opened out and a number of large rivers bridged at a total cost of over 60 lakhs. The opening out of the Kolar gold field has also created a new and important source of industry, which is said to afford employment to about 40,000 people in a district unusually liable to drought.

* Report on the History of the Mysore Famine of 1876-78 by Mr. Charles Elliot, C.S.I., Famine Commissioner.

638. These improvements are a substantial addition to the general wealth and well-being of the province, while the increased means of communication will enormously facilitate relief operations in the contingency of another famine. But with regard to the amount of protection afforded by irrigation, a matter with which we are more immediately concerned, it cannot be said that any very distinct advance has been made. Writing in 1877 the Famine Commissioner estimated that before the famine now are much the same as they of cultivation to each head of the population, and that about 15 per cent. of the cultivated area was under irrigation. So far as we can gather from the data which have been supplied to us, the conditions which the irrigated area bears to the whole area were then. The proportion which the irrigated area bears to the whole area of cultivation certainly does not appear to have increased by more than one per cent.

639. Under river channels, which are described as the most valuable form of irrigation in Mysore, a distinct advance has no doubt been made, and the area irrigated by these works has been nearly doubled within the past 25 years. But this means an increase of only 5 per cent. to the whole irrigated area of the province, and the increase is confined for the most part to the districts which are least liable to famine. Large sums have also been liberally spent in improving the tanks, but most of this expenditure seems to have been necessary to prevent retrogression, and it is not said to have led to any considerable increase in the tank irrigated area. On the whole, however, the extension of irrigation has fully kept pace with the increases in population and cultivation; and all things considered the State is now, no doubt, much better equipped to meet famine than it was in 1875. The position, as regards the district most liable to be affected by drought, will be still more improved when the great Marikanave tank is completed.

(iii).—*Scope for further extensions of State irrigation works.*

640. *General remarks.*—Outside of the area covered by the Western Ghats nearly every suitable site has been already occupied by a storage work. The only means of providing any considerable extension of irrigation in Mysore must therefore, as in the case of the Deccan districts of Bombay, be sought for in a system of canals depending for their supplies on large storage works in the western region of assured rainfall. Unfortunately, the main rivers of Mysore, having their sources in the Western Ghats, do not traverse the districts most liable to famine. Their courses lie close to the Ghats in deep valleys which separate the secure tracts on the west from the precarious plateau districts on the east. The Tungabhadra flows almost due north through the districts of Kadur and Shimoga, while the Cauvery and its main tributaries flow to the south-east through the districts of Hassan and Mysore. Storage works in the basins of both these rivers would be useful—on the Tungabhadra they would be invaluable—to the districts of Madras which they subsequently traverse, but they would be of little use to Mysore. The only portions of the State that could be commanded by them lie in the tract that least requires protection. All the difficulties that we have referred to in connection with the utilization of the broken courses taken by the rivers, the general level of the country, and the broken nature of its surface, would all be serious obstacles against any attempt to carry the abundant rainfall of the Ghats on to the main plateau of the province. These difficulties might no doubt be overcome, but in all probability the cost would be quite prohibitive. Nevertheless, the question is, we think, one of such vital importance to the State that no possible means be discovered for final, until a thorough and systematic reconnaissance has been made by a specially qualified Engineer. Should no possible means be discovered for utilizing rainfall stored in the Ghats, Mysore will have to rely, for any extension of its irrigation by means of State works in the tracts liable to famine, upon the improvement of its existing tanks and channels, and upon the construction of new works for the storage of local rainfall in the comparatively few catchments which are not already fully occupied.

WORKS IN PROGRESS.

641. *The Marikanave tank.*—At the time of our visit to the State two new irrigation works were under construction—the Borakanave tank to store 2,354 million cubic feet and irrigate 9,000 acres in the Tumkur district, and the Marikanave reservoir. The latter is a colossal work. The reservoir is being formed by damming up the waters of the Vedavati river in the Chitaldrug district. The crest of the masonry dam will be 142 feet above the river bed; and, with the reservoir full, the water surface will exceed 30,000 million cubic feet. While the volume of water impounded will exceed any existing reservoir in India, and but this is much more than the capacity of the project, which had been long under consideration, has always been a favourite one with engineers. On the other hand, although the catchment area is no less than 2,075 square miles, the supply will be liable to great fluctuations. The annual rainfall is 25 inches on an average, but it has been as low as 8 inches, and the run-off from the catchment is greatly reduced by a large number of existing tanks. The run-off corresponds to an annual rainfall of 30, 25, and 15 inches has been calculated at 19,000, 10,000, and 3,000 million cubic feet, respectively; and with a fall of 8 inches there would practically be no run-off at all. It is not considered that the tank will fill more than once in 30 years; but, owing to difficulties connected with the escape or waste weir, it has been found less costly to construct the dam to impound 30,000 million cubic feet than 20,000, the volume originally proposed. Provision is made for an overflow of 60,000 cusecs. The work is estimated to cost 39 lakhs, exclusive of establishment and indirect charges, and is a remarkably cheap one if regard be paid to its maximum storage capacity. But the area which it is proposed to irrigate in ordinary years is fixed at only 30,000 acres for which, according to the Mysore standard of 0.26 million cubic feet per acre, 7,841 million cubic feet should suffice. It is even considered doubtful if this area will be worked up to for many years to come, for the tract commanded consists mainly of black cotton soil and is sparsely populated by cultivators who are reluctant in changing dry for wet cultivation.

642. On this subject Colonel Grant, who has been for so many years connected with the Revenue Survey of Mysore, and than whom there can be no better authority, writes as follows:—

There are considerable stretches of black soil in the Devangere, Chitaldrug, and Hirnyur taluks. If black soil is unsuitable to irrigation, important works of irrigation, contemplated or in hand, will be defeated in their main object, and will certainly not be remunerative; the Marikanave project for instance. * * * We know that the rayats who occupy black soil, rightly or wrongly, have some prejudice against using irrigation. They have hardly ever made the experiment, the real truth being that the dry cultivation of black soil is very easy, and a bumper year makes up for several years of bad yield. Moreover, the rayats of these black cotton soils are quite unaccustomed to irrigation. Could the Pagavada and more eastern rayats be imported to Hirnyur, I have no doubt they could make something of the opportunities offered. My own opinion is that the black soil does not admit of regular irrigation, and that, the means of irrigation provided, water would go little further than saving the crops by moderate waterings. I speak here of irrigation for ordinary dry crops. If black soil be converted into what is known as wet land, I believe that it will take several years before good crops are obtained, and then only because sand and other earth has gradually been intermixed, and the whole has become friable.

Even if the full area of 30,000 acres of wet crops is brought under cultivation, the work is not likely to return more than 2 per cent. on its capital cost. But it has been sanctioned chiefly on account of its protective value, which in a year of drought should be considerable, even if the tank has been only half filled by the rainfall of previous years.

PROPOSED NEW WORKS.

643. *River channels and ghat-fed storage works.*—The existing dams are sufficient to draw off all the supply generally available in the rivers during the dry weather; and even if this were not the case, the Madras Government would object to any interference with the surplus, or the construction of any work likely to reduce the present dry weather supply of the canals in that Presidency.

Hence, for the supply of any new canals in Mysore, or to increase the dry weather supply of existing canals, it will be necessary to construct large storage reservoirs on the main rivers or their tributaries, and within the region of assured rainfall. We understand that sites for such works are now being systematically investigated, and that the discovery of suitable sites on the Cauvery or its branches will lead to a very large increase in the area under river channels; though, as we have already stated, it will probably be impossible to extend this form of irrigation to the tracts which are most in need of protection. The works, however, are, as we have shown, very remunerative, and the extension of these channels, even within the limits of the western districts, will be of very great benefit both to the cultivators and to the State. The investigations previously made, apparently in no very systematic way, have resulted in the discovery of only one possible site in the valley of the Cauvery; and even this has not proved practicable, for the construction of a reservoir would submerge the town of Fraserpet. A more thorough investigation, which should include those portions of Coorg and of the Madras Presidency lying within the upper valley of the river, may, however, lead to the discovery of other and more practicable sites. In the valley of the Tungabhadra some excellent sites have been found at Lakvalli and Mudaba; but, as we have said, reservoirs at these sites, though of great value to Madras, would apparently be of little use to Mysore. The site at Lakvalli has a catchment of 776 square miles, with an average rainfall of 150 inches. It is situated in an unhealthy tract and in the midst of valuable forests of teak; but in all other respects it is said to be one of the finest sites for a reservoir in the whole of India.

644. But, even if the investigations should result in the discovery of but a few suitable sites for new storage works, our evidence leads us to think that the area irrigated by river channels could be largely extended by improving the existing works. The Chief Engineer estimates that to provide proper masonry dams and to improve and extend the channels would cost about 25 lakhs. We think that the results would justify the expenditure, but this could easily be tested by remodelling a few selected works.

645. *Proposed new tanks.*—The list of proposed works contains 30 new tanks, most of which would receive no supply in a year of drought, though many, if not all, would be useful in a year of average rainfall. It is proposed to prepare the projects for these works in detail and to construct, as funds are available, any that promise to be remunerative; those which have a purely protective value being left for the employment of labour in a year of scarcity.

646. It is evident that there is not much scope for the extension of irrigation by means of new tanks constructed outside the region of the Ghats; but, as in the case of river channels, there is reason to think that the area matured under existing works could be largely increased, not only by improving the existing tanks, but also by thoroughly remodelling their channels and providing them with proper masonry or pipe outlets for the distribution of the supply; and also, in years of short rainfall, by restricting the area irrigated in proportion to the available supply.

647. *Cost of proposed new works and possible increase in the area irrigated.*—Excluding the two works under construction, the list of proposed new works contains 48 works estimated to cost 107½ lakhs, and to irrigate 107,000 acres in a year of ordinary rainfall and 56,000 acres in a year of drought. Of the latter area only one-fifth lies in the precarious eastern districts. These figures are not based on detailed surveys or estimates. They are admittedly only a rough approximation, and they do not include all the extensions that may be rendered possible by the construction of ghat-fed storage works, and by minor improvements which collectively should have an important effect. But we fear that they indicate generally, and, at least as regards the tracts most liable to famine, with sufficient accuracy, the limited field that exists for the extension of irrigation in Mysore by means of new State works. Such possibilities as there are will, we have no doubt, be fully utilized in the near future by a Durbar which has proved itself so liberal in the past in providing funds for the general improvement of the province.

(iv).—*Private irrigation works.*

648. *Private tanks.*—The private irrigation works in Mysore consist of tanks, wells, spring channels (called *talpargis*) and channels from hill streams. There are in all about 2,000 private tanks irrigating an area of 47,000 acres. Half of these are situated in alienated lands. Of the remainder many are old State tanks which were repaired by private individuals in consideration of a remission of one-fourth of the revenue. When a private individual constructs a new tank, we understand that no charge is made until the next revision of settlement, when the usual wet rates are assessed.

649. *Wells.*—Wells are extensively used to supplement the irrigation of garden and other lands situated under tanks. There are no separate statistics of the area irrigated in this way. The wells in such cases are usually mere shallow holes from which the water is lifted by means of a *pakota*. The areas irrigated exclusively from wells are practically confined to the four eastern or 'Maidan' districts, in which there are said to be 41,000 wells, irrigating in an ordinary year about 70,000 acres. In a year of drought the supply of these wells is, on the average, diminished by about a half; in but few cases does it fail entirely. Except in the vicinity of the tanks, upon which 75 per cent. of the wells of the province depend for their supply, the depth to the water surface, in which a *pakota* is worked by manual labour costs only a few rupees, while the well, 26 or 30 feet square and revetted with stone work, in which a leather bucket is worked by bullocks, costs three or four hundred rupees. Under rules issued in 1891 the State grants advances for the construction of wells, charging 3 per cent. interest and recovering the advance in 30 years. Since the issue of the rules 1,316 wells have been constructed by means of these advances. But for the further sinking of wells there is said to be very little suitable ground. The rules regarding the revision of assessment on well-irrigated lands, which appear to be very liberal, are printed in the appendix volume of this report.

650. *Spring channels and private river-channels.*—In the north-eastern part of the province springs are tapped in the sandy soils, and the water is conducted to the fields by channels which are sometimes of considerable length. These channels irrigate in all about 5,000 acres. We have no information as to the area under private channels from hill streams, but it is said to be considerable.

651. *Field embankment.*—In the black cotton soils of the Chitaldrug district, the practice is common of constructing small embankments, not so much to hold water as to collect silt and soil. Above these embankments, even in bad seasons when the crops fail elsewhere, gram, wheat, and cotton, are raised successfully.

(v).—*Famine works and programmes.*

652. *Famine programmes.*—Since the severe famine of 1877 there has been no need for works of famine relief in Mysore. Fortunately, there is not likely to be any difficulty in finding a sufficiency of suitable works for any future famine. The numerous tanks, which are in need of restoration and repair, the many miles—over 6,000—of roads, most of them metalled or gravelled, and four proposed new lines of railway, on which from the nature of the country there will be a large amount of cutting and embanking, should afford ample employment on earthwork and on the collection of road metal, for the maximum number of people likely to come upon relief. There are, in addition, the proposed new tanks to which we have referred, few of which are likely to be so large as to render it unadvisable to employ relief labour for their construction, under proper supervision. In future, reliance is to be placed mainly on these works for the employment of relief labour, the collection of metal being held in the background to supplement any deficiency in the programme of tank works. The village relief works will consist of filling objectionable pits and ditches, clearing prickly pear, deepening ponds and wells, and

constructing new wells, etc., supplemented by as many minor irrigation works as can be properly supervised. The importance of having a carefully considered programme prepared well in advance of a famine appears to be fully realized, and a detailed programme for each district is, we understand, now under preparation.

(vi).—Coorg.

653. *Irrigation in Coorg.*—In Coorg the average area annually under crop as 204,000 acres, or 1.13 acres per head of population. Of this nearly one half is under rice, 40 per cent. under coffee, and the balance chiefly *ragi*. The rainfall, which varies in average annual amount from upwards of 150 inches on the west to 40 inches on the east, is usually abundant; but about one-tenth of the area of the district, lying in a narrow strip along the eastern border, is affected occasionally by drought. Within this strip there are 27 irrigation works—tanks and small canals—which have been constructed at a cost of Rs. 75,000 and are said to be capable of irrigating over 5,000 acres, but there are no accurate records of the areas annually irrigated. One-third of the expenditure has been incurred on the Chikle Holé channels which apparently do not work successfully. We recommend that an officer with experience of irrigation works should be deputed to prepare projects for new works for the further protection of the tract liable to drought, and to advise generally regarding the improvements required in existing works.

SECTION IV.—HYDERABAD.

(e).—Local conditions; use and value of irrigation.

654. *Physical features.*—Excluding Berar, or the Assigned Districts, the territories of His Highness the Nizam embrace an area of 82,698 square miles, and contain a population of 11,141,142. They lie on an elevated plateau in the centre of the peninsula, and are traversed or bordered by four large rivers, whose sources lie within the region of assured rainfall in the Western Ghats. The Godavari flows through the greater part of its northern half of the State, and subsequently forms the south-eastern corner, and receiving on its way the waters of the Bhima, is joined by the Tungabhadra and takes the place of that river in forming the southern boundary. The plateau lies generally at an elevation of about 1,500 feet above sea level. The main watershed, separating the basins of the Godavari and Kistna rivers, crosses the State from the north-west to the south-east at a general altitude of about 2,000 feet, and divides it into two fairly equal parts. There are numerous ranges of hills, the most important of which run from east to west, but few of their summits rise to a height of more than 500 feet above the surrounding country.

655. *The Telangana tract.* *Soils and agriculture.*—The civil districts into which the State is divided are classed in one or other of two main divisions. The seven districts forming the eastern half of the province are known as Telangana; and the nine western districts as Marathwara. The line of demarcation is an irregular one, but its general direction may be found by connecting the point of junction of the Kistna and Bhima rivers with that of the Manjira and Godavari. There is a marked diversity in the characteristics of these two tracts, whether they be viewed from a geological, an ethnographical, or an agricultural standpoint; and in each aspect the distinction has a more or less important bearing upon the subject of our inquiries. The Telangana tract lies in the granitic and crystalline formation which covers a large portion of the Peninsula, and to the red and sandy soils of which irrigation is in general so freely applied. It is peopled, as its name implies, chiefly by Telugu-speaking races who, as a rule, are ready to make full use of all available facilities for irrigation. Within this tract rice is freely cultivated, the winter crop being known as *abi* and the summer crop as *tabi*. Both crops are irrigated from tanks, river channels, and to some extent even from wells.

656. *The Marathwara tract.*—The Marathwara tract lies, on the other hand, within the area of the Deccan trap series, and the prevailing soil is the usual

black cotton soil of that formation, in which as a rule excellent crops of wheat, cotton, and millet can be grown without artificial waterings. But, even when irrigation suits the soil, the cultivators in this tract, chiefly Marathas, are said to be averse from wet cultivation. Here, therefore, there are practically no tanks; and irrigation, which is chiefly from wells, is confined generally to the cultivation of garden crops.

657. This diversity of conditions has led to a distinction in the systems of land revenue in force in the two tracts. In the Marathwara districts the assessment, which is determined upon the Bombay Settlement system, both on wet and dry lands, is fixed for a period of 15 or 30 years, and ordinarily no remissions are given for damage to crops or for fields lying fallow. In the Telingana districts this rule applies to dry lands only; the assessment on rice lands being made subject to full remissions for any year in which the land may be uncultivated from a failure of the water-supply.

658. *The Carnatic districts.*—Of the nine Marathwara districts there are three in the south-east corner of the State—Lingsugur, Raichur, and Gulbarga—in which the conditions in some respects resemble those of the Telingana districts. The subsoil water is, as a rule, much farther from the surface; but the soil is for the most part of the same nature, and the inhabitants, being largely Canarese, understand and practise irrigation. These are sometimes known as the Carnatic districts, and for our purposes it will be convenient to retain this distinction.

659. *Extent of cultivation and irrigation.*—Out of a total of nearly 53 million acres comprised in the State, statistics are available only for the cultivable and forest areas of *khalsa* lands, or in all for about 23 million acres, of which 2½ million are under forest. About 3 million acres are returned as cultivable waste, and of this 90 per cent. lies in the Telingana districts. Out of about 17½ million acres under occupation in the year 1900, one million acres or under 6 per cent. were assessed as irrigable. The occupied and actually irrigated areas are distributed as follows:—

| Tract. | Area of dry cultivation. | Area assessed as irrigable. | PROBABLE NET AREAS ACTUALLY IRRIGATED. | |
|----------------------|--------------------------|-----------------------------|--|---------------------------|
| | | | In a year of normal rainfall. | In a dry year, 1899-1900. |
| | Acres. | Acres. | Acres. | Acres. |
| Marathwara | 8,581,165 | 238,572 | 285,447 | 288,487 |
| Carnatic | 4,496,725 | 61,440 | 58,430 | 48,888 |
| Telingana | 4,350,438 | 706,868 | 478,049 | 66,294 |
| TOTAL | 17,428,328 | 1,006,880 | 772,926 | 373,669 |

660. *Area of cultivation per head of population.*—There are no accurate statistics of the area annually under crop, but adding the net area irrigated in a normal year to the dry area, the total works out to 2 acres per head of the population of 8,178,952, comprised in the *khalsa* area. For the Telingana tract the proportion is about 1 acre, and for Marathwara about 3 acres per head.

661. *Rainfall and famines.*—In Marathwara the annual rainfall varies from an average of 30 inches on the east, to 40 inches on the west side. This tract suffered from famine in 1877, and again in 1899 when the northern districts received only 12 inches and the southern 15 inches of rain. The Carnatic tract, for which the average is only 26 inches, is specially liable to be affected by drought. It suffered severely in 1877, in 1897, and again in 1900. In the Lingsugur district, which closely resembles the neighbouring district of Sholapur in the Bombay Presidency, scarcity is said to be almost chronic, and famine or severe distress is expected once in every twelve years. In Telingana the average rainfall varies from 31 inches in the south to 41 inches in the north; but in every district the fluctuations from year to year are considerable, the limits being from about half the normal, as in 1899, to 50 per cent. above the normal, as in 1893. Even, however, with half the normal rainfall a considerable area of dry crops can generally be matured in the more sandy soils of this tract; and in 1899, though there was severe distress, there was no actual famine. The large number of ordinary works then in hand afforded sufficient employment to the people; and it was not found necessary to open special works of relief.

662. *General conclusions.*—With reference, then, to the general question of the utility of irrigation in Hyderabad, it may be said that in the Telingana and certain portions of the Carnatic tracts, which comprise more than half the total area of Hyderabad, irrigation is vitally essential to the well-being of the people and to the general prosperity of the State; and that the soil is suited to it and the people eager for it. No stronger evidence of this could be given than is afforded by the great difference between the average rates of revenue assessment on wet and dry lands, which, if the areas are correct from which the rates are calculated, appears to amount to not less than Rs. 10 or Rs. 11 over the whole of the Telingana and Carnatic districts. This is very much higher than the average charge for water advantages, whether taken in the form of a water-rate or of an enhancement of the land-revenue rates, that is obtained in any British province or in any other Native State, although there is no reason for believing that the rates in them are unduly low. The fact that such a charge can be realized not only indicates the great utility of irrigation in these tracts, but also renders all expenditure in extending irrigation highly remunerative. In the remaining, or Marathwara districts, irrigation in ordinary years is employed almost solely for the cultivation of garden crops: the benefits that the staple field-crops would derive from irrigation themselves, in spite of the least, extremely doubtful; while the cultivators themselves, in spite of recent adverse seasons, have shown no desire to change their present extensive dry cultivation for the more laborious cultivation of rice and other wet crops.

(ii).—*Existing State irrigation works.*

663. *Classes of works.*—The State irrigation works in Hyderabad consist of tanks and small canals, and are practically confined to the Telingana and Carnatic districts. Most of them are old works of which the original cost is not known; and we have not been furnished with statistics showing separately the areas irrigated by wells and by the various classes of State works. It is therefore impossible to show, with any degree of exactness, their value as productive works, and of their protective value only a general indication can be given.

664. *Canals.*—The principal canals take off from the Tungabhadra river and irrigate a total area of 3,732 acres, yielding a yearly revenue of Rs. 51,962, or Rs. 14 per acre, of which Rs. 1-8 per acre is spent in annual maintenance. The supply from the river is unfailing, and the works are therefore, so far as they go, useful protective works, besides being undoubtedly highly remunerative. There are also two old channels, each about 70 miles in length, taking off from the Musi river and ending in a large tank near the town of Nalgonda. The channels were constructed many centuries ago, but they have fallen into disrepair and are not now used for irrigation. There are besides a number of minor channels

taking off from above weirs constructed across the smaller streams. Unfortunately in Telingana, where water is most required, these streams dry up soon after the cessation of the rains, and no water is available for the late or, as it is here called, the *tabi* crop. The retentive black soil of Marathwara parts with its water more slowly, and the streams supplied by it carry water long after those of the Telingana districts have ceased to flow. It is, indeed, asserted that the greater part of the hot weather flow of the Kistna and Godavari consists of drainage from the trap formation within the Nizam's territories.

665. *Tanks*.—While the few canals of the State irrigate chiefly in the Carnatic districts, its 18,000 tanks are situated almost entirely in the Telingana tract, where nearly every suitable site is said to be occupied by a tank. They are all either small or of moderate size, the largest having a capacity of under 300 million cubic feet. Many of them—and these are the most successful—are fed by channels taking off from a stream or river. To be really efficient such channels should, it is said, be capable of filling the tank within a period of 35 days. All tanks, except the largest, that are not fed in this way fail in a year of extreme drought such as 1899-1900, but not necessarily in a year like 1896-97, in which drought followed an abundant early rainfall.

666. *Restoration and upkeep of tanks*.—The majority of the tanks are said to be breached or otherwise in a state of disrepair. But a great deal has been done to improve matters in this respect since 1893, when, under the advice of Mr. A. J. Dunlop, Revenue Secretary to His Highness' Government, practical steps were taken to revive the old system of *dastband*. Under this system a certain share, generally 8 or 10 per cent., of the revenue dependent on a tank, is paid in cash, or its equivalent is granted in *inam* lands or in a reduction of assessment, to a lessee who undertakes the maintenance and repair of the tank. The lessee, or *dastbandar* as he is called, is invariably an influential man, who either himself owns land under the tank or has a personal interest in its upkeep. In many cases he is a descendant of the original constructor of the tank, and he probably holds some hereditary local or village office, such as that of *Desai* or *Deshmukh*. In return for his share of the revenue he is required at his own expense to repair all breaches within a reasonable time, to keep the banks and sluices in good order, and the main distributary channels clear of silt.

667. The larger tanks, however, were often found to require not only extensive repairs but actual restoration, for the satisfactory execution of which skilled supervision was essential. For this purpose, among others, there was formed in 1896 a separate Irrigation Department under a Chief Engineer (Mr. Roseoe Allen) whose services were lent to the State by the Government of India. Under his supervision plans and estimates are now prepared, and the work of restoration is carried out, before a tank is handed over to the lessee. During the past eight years, 5,487 tanks have been leased out on the *dastband* system, the revenue on the 276,000 acres irrigated by them amounting to over 29 lakhs. The *dastband* system appears to give general satisfaction, and to have led to excellent results; but in working it two points are essential, namely, the selection of the lessees from among local or village hereditary officers of influence, and a proper system of periodical inspection. As a rule, it is the smaller tanks only which are leased out for repair. The larger tanks and irrigation systems are maintained by the Irrigation Department, on annual grants which are limited to 10 per cent. of the revenue dependent on the work.

668. *Method of financing the tank restoration work*.—When the plans and estimates for the restoration of a tank have been prepared and sanctioned, if there is any difficulty in obtaining an early allotment of the necessary funds, the work is carried out under a system of deferred payments. A contractor carries out the work under departmental supervision, but at his own expense, receiving 5 per cent. on his outlay and all the revenue realized from the tank until the debt is paid off. Often the contractor holds land under, and has an interest in the tank, and subsequently he becomes the *dastbandar*.

669. Under this system 1,472 tanks have been repaired at an estimated cost of 42 lakhs. A large tank at Kamaredipet, which we inspected, had recently

been restored under this scheme, at a cost of Rs. 35,000, and now brings in an annual revenue of Rs. 17,000. There are many other similar instances; and, though there may possibly be doubts as to the return to be derived from the construction of new storage works in Hyderabad, there can be no question as to the highly profitable nature of these works of restoration. The great value of these schemes, both for the restoration and the maintenance of the tanks, has lain in their adaptability to the special circumstances of the case. A considerable expenditure was required which was certain to be highly remunerative, but for which, owing to the pressure of famine and other circumstances, funds were not readily available from the State Exchequer. The certainty that large revenues would accrue made it possible for the State to pledge those revenues, or a share of them, beforehand, with a perfect assurance that persons would be found willing to take up the work in return for the pledge. The local influence of these persons, and their interest in the efficiency of the tanks, also made it probable that the work would be as well done as their resources and abilities would admit. Thus, without straining its exchequer in any way, the State has been able to finance a large amount of highly remunerative irrigation work, while the expenditure on its Irrigation Department has actually declined.

(iii).—*Scope for further extensions of State irrigation works.*

670. *Projects and surveys.*—Since the formation of an Irrigation Department in 1896, in addition to the restoration of about 500 of the larger existing works at an actual cost of 34 lakhs, and of many smaller works at a cost of 4 lakhs, a large number of projects have been prepared for the construction of new tanks and for the restoration of other works. Including the works already constructed, or now in course of execution, estimates amounting to 80 lakhs, and affecting an area of 226,000 acres, have been sanctioned by Government; additional projects for 120 works, estimated to cost 24 lakhs and to irrigate upwards of 60,000 acres, are now under consideration; while surveys are being made for a number of other projects which, it is roughly estimated, will afford protection to 130,000 acres.

NEW WORKS IN THE CARNATIC DISTRICTS.

671. *The Benur project.*—The most important of the projects which have been prepared for the protection of the Carnatic districts, is one for the restoration of an old dam or anicut on the Tungabhadra river, and the construction of a canal, at a cost of 8 lakhs, for the irrigation of 10,000 acres in the Lingsgur district. The Madras Government raised objections to the construction of the work on the ground that it would interfere with the full utilization of existing canal works in that Presidency, but this objection has now been waived. This work should materially assist in the protection of a district which is singularly liable to suffer from deficient rainfall. Unfortunately, there does not seem to be any scope for further works of a similar nature, as only a very limited area on the Hyderabad side of the river can be commanded from the Tungabhadra. Even if a large reservoir above Hospet were constructed, as has been proposed in Madras, the only benefit to Hyderabad would lie, it is said, in a possible increase of 8,000 acres to the area irrigated by the Benur and existing channels.

672. *The Bhima and Kistna rivers.*—The investigations in progress in the valley of the Bhima river had not so far resulted in the discovery of any feasible project, owing to the small slope in the bed of the river and to the unfavourable conformation of the country. From the Kistna, however, it is thought possible to take out a canal on the left bank, which would irrigate a very large area lying between that river and the Bhima. No detailed surveys have yet been made, and beyond ascertaining the possibility of the project nothing has been done. The area which the canal would command is estimated at 200,000 acres. The withdrawal from the Kistna of a volume sufficient for the irrigation of anything like that extent of country, would interfere seriously with the supply of existing canals in Madras. This difficulty might be met by the construction of storage works, if a sufficient number of suitable sites could be found; but this would add enormously to the cost of the project which, even without storage, is estimated at a crore of rupees. It might, perhaps, also be satisfactorily met by the construction by the Indian Government of the great storage work on the lower Kistna to which reference is made in the chapter on Madras, and this may be a

weighty argument in favour of that project. With so much to be done in the restoration of existing works, and in the construction of small but highly remunerative new canals, it seems improbable that His Highness's Public Works Department will be in a position to undertake such a large scheme for some years to come.

673. *General scope of proposals.*—For the further protection of these districts the only remaining project of any importance is one for the construction of a large reservoir on the Muski river, to irrigate 6,000 acres in the Lingsugur district. The restoration and repair of existing tanks is estimated to add another 10,000 acres to the present irrigated area. Adding these to the areas that may be irrigated by the proposed Benur Canal, and by possible extensions of existing canals, we obtain an area of 34,000 acres as the total increase that it seems possible to effect in the protected area within a reasonable time. This will not afford anything like adequate protection to the Carnatic districts, but it will mean an addition of 50 per cent. to their present irrigated area.

NEW WORKS IN TELINGANA.

674. *Works in progress.*—In the Telingana districts, of the new works under construction the most important are a canal, costing 10 lakhs, taking off from the Manjira—a large tributary of the Godavari—to fill a number of tanks and irrigate in all about 20,000 acres; and the restoration of the channels from the Musi river, to cost 2½ lakhs and irrigate 24,400 acres. A number of tank restoration works are also in progress.

675. *Projects under consideration.*—The field for further extensions has not yet been thoroughly investigated; but, in addition to restoring a large number of derelict works, there is apparently some scope for the construction of new storage works, and a very large scope for the construction of channels, not so much for the purpose of direct irrigation as to connect the tanks with the rivers and ensure them a supply in years of deficient rainfall. The proposed dam across the Kistna may render it possible to command a considerable area in the Warangal district by a canal from the left bank, but it is doubtful if the land is suitable for irrigation. The question is one which will deserve investigation when the general project is under preparation. The most important projects now under consideration are those for a second canal from the Manjira river, to irrigate 12,000 acres and feed a large number of tanks in the district of Indur; a canal from the Godavari to irrigate 45,000 acres in the Elgandal district; the restoration of the large Parkal tank, and the construction of a new tank for the irrigation of about 25,000 acres, in the Warangal district; and the construction, at Sangam, in the Mahbubnagar district, of a large tank which would irrigate about 10,000 acres. Many of these works are likely to be very remunerative, and even the new storage works are estimated to return 4 or 5 per cent. on their cost. In restoring some of the larger tanks we would recommend the adoption of self-acting gates for the waste-weirs, such as are now in use in Bombay.

676. If all the works now contemplated, exclusive of the Kistna reservoirs, are carried out, the area under irrigation in the Telingana district will be increased by nearly 400,000 acres. Even this addition may not afford complete protection; but it should at least prevent a recurrence of anything like the severe distress that has been recently felt in many parts of Telingana.

NEW WORKS IN MARATHWARA.

677. *Remarks and suggestions.*—The operations of the Public Works Department have hitherto been practically confined to the Carnatic and Telingana districts, though some expenditure has been incurred in a small Telingana-like tract in the Nander district. Excluding this small area, the conditions in Marathwara are anything but favourable for the development of irrigation. Irrigation is not necessary save in exceptional years of drought. In ordinary years it is not only unnecessary but it would often do harm; for irrigation during a break in the rains,

followed by an unexpected downpour, would inevitably result in serious injury to the crops. As is the case almost everywhere in the black soil tract, irrigation can be usefully applied to limited areas of garden crops, but, unless the prevailing system of agriculture is to be changed with very doubtful advantage to the people, anything like extensive irrigation is hardly to be hoped for; and, at best, the process of extending irrigation will be a very gradual one. There appear, however, to be in most districts considerable areas of soils that are suitable for irrigation; and in many districts there was, during recent famines, a scarcity even of drinking water. We think, therefore, that the construction of reservoirs, with catchment areas large enough to ensure a supply of water in all years, would probably afford the most useful employment that could be found for relief labour in Marathwara; and that it would be advisable to have the country examined with a view to the preparation of projects of this nature, and to their inclusion in a programme of relief works. It is even possible that this examination may disclose sites for tanks or other works, which are worth taking up before the occurrence of another famine. There are also a certain number of existing irrigation works which probably command lands that are suitable for irrigation, and examination may show that it would be advantageous to have many of them repaired as ordinary public works. And, where the land is suitable for irrigation, small irrigating channels might be taken out from above weirs constructed across some of the numerous streams which are said to afford a supply of water throughout, and for some time after, the rainy season.

(iv).—*Private irrigation works.*

678. *Classes of works.*—The private irrigation works in Hyderabad consist of wells and tanks. In many cases the latter are small Government tanks which have been repaired by the cultivators at their own expense. There are also a number of irrigation works, some of them apparently irrigating considerable areas in *jagirs* or private estates; but with regard to these we have no information.

679. *Wells.*—In the *khalsa* lands there are in all 96,589 wells used for irrigation; of these about 40,000 are in the Telingana districts where a well for two buckets, and about 20 feet square, sunk to a depth of 30 feet, costs on an average about Rs. 300. The small temporary well in the immediate vicinity of a tank costs Rs. 15 or Rs. 20. In dry years these are made in large numbers to supplement the supply from the tank; two acres per bucket are assessed at well rates, but one bucket is said to irrigate annually two acres of cane, or three of rice, or four of other crops. In these districts, cultivators who convert dry into wet lands at their own expense are granted a lease for 30 years; during the first-half of that period they pay the ordinary dry rate on the lands irrigated, and this is doubled during the latter half; on the expiry of the lease the lands are assessed at the usual wet rates. Under this system there is said to have been a considerable increase in the number of wells, but most of our witnesses considered that it would be advisable to charge nothing exceeding the ordinary dry rates for the full period of the lease. For lands outside the *ayakat* of a tank, the ordinary well rate is about Rs. 10 per acre. Within the *ayakat* all lands are assessed at the full tank rate of Rs. 12 to Rs. 15, but a lower rate is fixed if a well is used annually to supplement the tank supply. If it is only used occasionally, the cultivator has to claim a remission for that year.

680. In the Marathwara and Carnatic districts, where the Bombay system of settlement has been followed, at revision of settlement no increase is made in the assessment on account of improvements effected at the expense of the tenant. This concession, however, has not, it is stated, led to any considerable increase in the number of wells, owing to the poverty and indebtedness of the tenants, to the high rate of interest (18 to 24 per cent.) charged by the sowcar, and perhaps to there being no allotment of funds by the State for *takari* loans in ordinary years. Without reliable figures of the numbers of wells made since settlement we are unable to criticize the accuracy of this statement. During the famine the State granted loans at 6 per cent. and they were freely taken; but a well in these districts costs from Rs. 300 to Rs. 600, and the witnesses express doubts whether in ordinary years advances would be taken readily even if funds were

made available. We think, however, that a fair trial should be made, for in the extension of wells lies, probably, the best hope of affording any appreciable measure of protection to the Marathwara districts.

681. *Borings*.—No serious difficulties appear to be experienced in the Telingana districts in selecting a suitable site for a well, as trial pits are dug by the cultivators at small cost. But for Marathwara and the Carnatic we would suggest a systematic survey of the underground supply, such as we have recommended for similar tracts in British territory.

(v).—*Famine works and programmes.*

682. We have no information as to the expenditure incurred on relief works in Hyderabad during the recent famine. The works were confined to the Marathwara districts where there is no irrigation establishment; and the labour was employed chiefly on the earthwork of roads and railways, and in deepening village tanks. Neither were we informed as to the extent to which programmes of works had been or were being prepared against the contingency of another famine. We consider it of great importance that a full and adequate programme should be prepared without delay, if it has not been already prepared, particularly for such portions of His Highness' territory as adjoin the frontier of British India. It is of the greatest importance that work should be ready on both sides of the frontier, for the simultaneous employment of His Highness's and British subjects, in the unhappy event of famine afflicting the territories of both Governments at the same time. As regards the future, there appear to be no definite programmes of relief works. In the Telingana and Carnatic districts there would be a considerable field for the employment of relief labour on the construction or restoration of irrigation works which have been sanctioned or proposed; but famine is less likely to occur in the former of these tracts than in the Marathwara. We have already suggested an examination of this tract with a view to finding sites for tanks which might be included in a programme of relief works. But, whether such sites can be found or not, we consider it of the highest importance that a suitable programme of relief works should be prepared and maintained for this portion of His Highness's territories, so that work may be ready on both sides.

SECTION V.—BERAR.

(i).—*Local conditions; use and value of irrigation.*

683. *Main physical features*.—Berar, although lying almost entirely within the area of the Deccan trap formation, is divided into three tracts of markedly different physical characteristics. In the north, where the southernmost range of the Satpuras cover an area of about 2,000 square miles, the surface of the country is broken into a succession of hills and deep ravines. In the south, over nearly one-half of the total area of the province, the conformation is that which is so commonly found in the plateau regions of the Deccan—an undulating surface broken here and there by low and generally barren hills. The rugged country to the north is known as the Melghat, and the more gently undulating country to the south as the Balaghat. Between these two tracts lies a fertile and comparatively level valley, through which the Purna flows from east to west in its course towards the Tapti river. The Purna and the Wardha, the latter of which forms the eastern boundary of the district, are the only rivers of any importance. The total area of the province is 17,710 square miles.

684. *Soils and agriculture*.—In the southern plateau tract, in the valleys of the Melghat, and for a width of 8 or 10 miles from the base of the hills on either side of the central valley, the soil generally is either a brownish loam, or one of the light varieties of black soil to which irrigation is suitable. In many parts of the eastern half of the central valley, that is in the upper basin of the Purna, the black soil overlies *muram*, and its depth apparently is not so great as to preclude the possibility of irrigation; but towards the west and centre of the

valley the black soil becomes of the deep and rich alluvial variety to which irrigation would be quite unsuited, even if, over large areas of it, there were not already distinct signs of salt efflorescence.

685. In a normal year, the total area of crops sown is 6,820,000 acres, or 2.48 acres per head of a population of $2\frac{3}{4}$ millions. Of this area 38 per cent. is *judr*, 34 per cent. cotton, and about 9 per cent. wheat. Unirrigated rice is grown on 45,000 acres. The irrigated area varies from 43,000 to 80,000 acres, and forms, on an average, less than one per cent. of the whole area under crops. Wheat, garden crops, and sugar-cane, are the principal crops irrigated in an ordinary year.

686. *Rainfall and famines.*—The average annual rainfall varies, in the Melghat tract, from 28 inches at the foot of the hills to upwards of 66 inches at Chikalda, which lies at a height of 3,664 feet above sea level; and, in the remainder of the province, from 29 inches on the west to 35 inches in the north-east, and 45 inches in the south-east. In 1899, when the rainfall was the smallest on record, the general average over the whole province was about one-third of the normal, but many of the recording stations in the three south-western districts received less than a quarter of the usual amount. In that year the area from which crops were harvested was only 30 per cent. of the area sown in a normal year, and there was an almost complete failure of the crops in the western half of the province. As a general rule, however, the rainfall of June to September is abundant and certain; while that of October is variable and often insufficient, and the province receives usually but a very small share of the retreating monsoon of November and December. In 1896 there was ample rain in the earlier months of the rainy season, but the later rains failed and led to a partial failure of the *kharif*, and an almost total failure of the *rabi* crops. But the effect of the failure in 1896 was only very partial distress, nowhere sufficient to necessitate relief operations on any large scale, or seriously to increase mortality. In 1899, on the other hand, there occurred severe famine resulting in extensive relief and a considerable mortality. Such a calamity as this must be regarded as extremely rare in Berar, which is traditionally regarded by the people of the Deccan as their refuge in times of scarcity.

687. *Utility of irrigation.*—For the ordinary staple crops—*judr* and cotton, which form over 70 per cent. of the total cultivation—in all ordinary years irrigation is unnecessary; and, although Berar can no longer be regarded as immune from famine, there are no means of providing irrigation to an extent at all sufficient for the adequate protection of these crops in a year of severe drought. The utmost that can be done is to afford a certain amount of protection to the *kharif* crops and to the *rabi* sowings, against a failure of the late rains; and to provide means for extending the cultivation of wheat, rice, vegetables, and sugar-cane, where the soil and other conditions are suitable for the cultivation of those crops. With cultivators so conservative in their agricultural habits as those of Berar appear to be, and in general so prosperous and free from fear of serious drought, a change from dry to wet cultivation, even in the most suitable tracts, will at the best be a slow and gradual process.

(ii).—*Existing State irrigation works.*

688. With the exception of a few small tanks which have been practically dry of recent years, and which even in favourable years irrigate quite insignificant areas, there are no State irrigation works in Berar.

(iii).—*Scope for further extensions of State irrigation works.*

689. The Purna, the only perennial river in Berar, flows at a very slight slope, between banks which are 50 to 70 feet above the bed, and through soil which appears to be, for the most part, quite unsuited to irrigation. Thus the Melghat and Balaghat tracts, and the narrow strips immediately adjoining them and bordering the central valley on either side appear to offer the only field for

the construction of State irrigation works. In both these tracts it should be possible to construct a considerable number of storage tanks, and of small canals taking out of the numerous rivers and streams which carry the drainage of the high lands into the Purna and Wardha rivers. Any tanks constructed in the Balaghat tract will be liable to fail in a year of severe drought; but in the higher hills of the Melghat the rainfall is more certain, and it may be possible to find here some suitable sites for large tanks such as will afford an assured supply of water in all years. No proper reconnaissance of the country has, however, yet been made. We cannot, therefore, at present do more than indicate, in this general way, the tracts in which it may be possible to extend irrigation by means of Government works, and the remainder brought to be most suitable to them; and recommend that the necessary surveys and preparation of projects be put in hand as soon as possible. The more promising schemes might be carried out as experimental works, especially in the Melghat, will on to the programme of famine works. The small canals will probably prove fairly remunerative, and their protective value, especially in the Melghat, will be considerably enhanced if their supplies can be supplemented from storage works constructed in the valleys above. The other class of works,—those which will have to depend on storage for their whole supply,—are much less likely to prove remunerative, and it may be doubted if they will ever yield a revenue sufficient to cover the annual interest charges and working expenses.

(iv).—*Private irrigation works.*

690. *River channels.*—There are a few small private channels taking off above temporary dams constructed across streams and irrigating, in all, about 1,000 acres. The cultivators pay to Government for the use of the water an increased assessment which varies from Rs. $1\frac{1}{2}$ to Rs. 5 per acre, according as the water lasts till the end of January or the end of May. In many of these works it may be advisable to substitute for the present temporary structures either permanent masonry dams or self-acting flood gates, to be erected and maintained at the expense of Government; the maintenance of the channels and the distribution of the water being left as at present in the hands of the cultivators.

691. *Tanks and wells.*—There are no private irrigation tanks in Berar. The holdings generally are too small to admit of tanks being constructed by private persons, even if they had the necessary means. Thus, practically, the whole of the irrigation is from wells. The depth to water surface varies considerably according to the locality; but, excluding the high lands of the hilly and plateau tracts, the average depth appears to be about 30 feet. The supply generally is from percolation, but in many places good springs have been found. During the past seven years the water level has sunk considerably, and in 1900 a large number of wells ran dry; but many of these were deepened and are said to have then yielded an ample supply. In many parts of the Purna valley the water is brackish; elsewhere it is of good quality. A well costs on the average from Rs. 300 to Rs. 500, and is said to irrigate about 4 acres annually; but for the Buldana district, in which lies more than half the whole irrigated area of the province, the number of irrigation wells is shown as 5,714, and the area irrigated from them in 1897-98 as 54,669, giving an average of $9\frac{1}{2}$ acres per well—a result which suggests some doubt as to the accuracy of the statistics for that year.

692. *Loans for the construction of wells* are advanced by Government, bearing interest at $6\frac{1}{4}$ per cent. During the past five years 2 lakhs have been advanced for new wells, and over a lakh for the improvement of wells and fields. The loans, however, are not taken freely except in years of drought, owing partly to the high cost of a well and partly to the uncertainty of finding water. Loans irrigated from wells constructed before the original settlement are assessed at the maximum dry crop rates; and those from wells constructed since the settlement at ordinary dry crop rates. We gather that improvements are perpetually exempted from enhancement as in Bombay. But there seems to be a similar uncertainty as to the exact effect of the law. No pains should be taken to get the people perfectly informed on the subject.

693. The portions of Berar which are suitable for well irrigation resemble in many respects those of the adjoining Deccan districts of Bombay; and the recommendations made in the Bombay Chapter regarding the encouragement of wells and surveys of the underground water-supply in those districts may be read as applying also to Berar. Except that Berar being so much less liable to drought, the special measures recommended in our general chapter for districts exposed to famine, and in particular free grants-in-aid, are less required than in the Deccan.

(v).—*Famine works and programmes.*

694. During the famine of 1899-1900 an expenditure of over 90 lakhs was incurred by the Public Works Department on works of famine relief—54½ lakhs on roads, 14½ lakhs on railways, 9½ lakhs on tanks for the water-supply of towns and villages, and the balance on establishment, etc. No expenditure was incurred on purely irrigation works; but a large tank in the Amraoti district, which supplies water to the town of Karinja and is said to irrigate a considerable area, was improved and enlarged at a cost of Rs. 1,08,391. The work has been practically finished with the exception of the enlargement of the catchment area which will admit of an extension of the irrigated area. We recommend the completion of this work which is estimated to cost Rs. 8,000.

695. The programme of future relief works provides employment for six months for 25 per cent. of the total population, but the works are somewhat unevenly distributed. For instance, in Akola and Buldana, two districts of the precarious western tract, provision is made for 9½ and 12½ per cent., respectively, of the population; while in the eastern district of Wun, where there was very little distress during the last famine, the programme provides for 38 per cent. The collection of road-metal, though a useful form of work, occupies too prominent a place in the programme. The expenditure under this head forms 80 per cent. of the total cost of the works, and would, it is said, provide all the road-metal likely to be required for ten years. When the survey recommended in paragraph 689 has been carried out, it should be possible to reduce this item to reasonable dimensions, and to include in the programme a fair number of really useful irrigation works. Special arrangements will have to be made beforehand to provide a supply of drinking water at the sites of many of the works. Where this is necessary, the arrangements should be made as soon as the work has been brought on to the programme.

SECTION VI.—BARODA.

696. *Divisions of the State.*—The State of Baroda, with an area of over 8,000 square miles, consists of four separate divisions. The Amreli Division (1,245 square miles), which is situated in the peninsula of Kathiawar; the Kadi Division (3,000 square miles), which lies north-east of the Neamgam Taluka of Ahmedabad district; the Baroda Division (1,887 square miles), which adjoins the districts of Kaira, Broach, and the Panch Mahals; and the Navsari Division (1,952 square miles), which consists of several detached portions lying mostly to the east of the centre of the Surat district. The physical and other characters of these four divisions may be taken to be approximately the same as those of the Native States and British Territory adjoining them; and the treatment for purposes of irrigation will be found generally to correspond in both cases.

697. *Amreli Division.*—The Amreli Division consists of two portions separated by the Gir hills of Kathiawar; and in these hills lie the head-waters of two minor rivers of that province. It is possible that storage works of moderate size might usefully be constructed here, and the examination of the country, which we have recommended for Kathiawar, should be extended to the Amreli Division. There are four projects of irrigation from small reservoirs in this division at an estimated cost of about 11 lakhs; but we have not information sufficient to enable us to pronounce on the merits of any of them. If anticipations formed by the Durbar are correct, one of them, the Shingoda, may prove remunerative and

irrigate 3,000 acres; and the other, the Pichvi, which would irrigate 5,600 acres, will be a useful protective work. As regards the other two, there may arise, with the State of Bhavnagar, territorial difficulties of the kind adverted to in the section on Kathiawar.

698. In this division there are about 5,500 wells, of which 1,800 are permanent. The area irrigated from them is estimated at 16,500 acres. The water-level nowhere exceeds 40 feet, and wells are not difficult to dig. Extension seems to be feasible on the same lines and to the same degree as in Kathiawar. Here, during the late famine, 129 wells were made by the State at a cost of nearly Rs. 96,000, or about Rs. 750 per well. The Baroda Durbar and the neighbouring States of Kathiawar evidently adopt the same policy in this respect.

699. *The Kadi Division.*—The soil of the Kadi Division is a sandy variety of the gorat soil of Gujerat. The notable feature of the division is that a considerable portion of the Sabarmati river forms the eastern boundary separating the division from the Idar State. The State officials informed us that close beyond the boundary they have discovered a fine site for the storage of the waters of that river. The prospects of this scheme, of which the scope may prove to be very large, and the mode in which the water should be utilized, require investigation. There are several other smaller schemes on the merits of which we are equally unable to pronounce.

700. This division contains 43,000 out of a total number of 56,000 wells in the State. The area irrigated is estimated at about $2\frac{3}{4}$ acres per well, and amounts therefore to about 118,000 acres. There is, very probably, room for a material extension of well-irrigation in this division.

701. *The Baroda Division.*—The Baroda Division, like the district of Broach, consists mostly of black cotton soil in which irrigation is not likely to be very highly appreciated. A project, however, for damming the river Orsang, a tributary of the Nerbudda in the north-east of the division, has been partly executed. The general scheme received the approval of Mr. Whiting, a retired Public Works Officer of great knowledge and experience. The dam has been completed and the subsidiary works and canal are well in hand. The flow in the river during the recent drought has, however, been much less than was anticipated, and storage will be required to supplement the flow in dry years. We have no information as to the volume of additional storage that will be required or as to the cost of providing it; but the canal, including one storage work, is estimated to irrigate 12,500 acres at a cost of 10 lakhs, or Rs. 80 per acre. This is a cheap rate for works in this kind of country, if, as represented, the soil commanded is generally suited for irrigation. The prospects of the work would therefore appear to be sufficiently promising to justify a considerable expenditure on securing an assured supply. The other works, already constructed or now proposed, are small and of comparatively little importance.

702. The division contains only a small area of well-irrigation which is probably incapable of great extension in the black soil areas.

703. *The Navsari Division.*—The Navsari Division, like the Surat district, which it adjoins, is comparatively little exposed to famine. But there are at least two large projects for utilizing the waters of the Jankri and Purna rivers for purposes of rice irrigation. There is probably no urgent need for irrigation in the tract to be commanded, which adjoins the Bardah and Jelalpur sub-divisions of Surat, where there was but little famine. But the waters of these two rivers, like those of the proposed Tapti left bank Canal, might prove valuable for purposes of rice irrigation, and the Government of His Highness may well be advised to complete the examination of both projects.

704. Except in a portion adjoining the coast, where fine garden cultivation is practised in splendid loam soils similar to those of the adjacent portions of the Surat district, there is little well-irrigation in the Navsari Division, which is

probably not one of the areas in which very special encouragement of this form of irrigation is required.

705. *General conclusions and recommendations.*—Generally it may be said that the conditions of the Baroda State, excepting the Amreli Division, resemble those of British Gujerat. That the country felt the full force of the famine of 1899-1900 was shown at the census of 1901, when the population was found to have diminished by 19 per cent., a loss even greater than that of British Gujerat or Kathiawar. The need of protection from famine is fully as great in Baroda as in those provinces, and the existing areas under irrigation are very small. In the parts most exposed to famine, the obstacles to the extension of irrigation are no less formidable than in Gujerat. But it is urgently necessary that such possibilities as there are of extending irrigation should be definitely ascertained and developed. It is satisfactory that a beginning has been made in the investigation of projects. We understand that His Highness's Government contemplates allotting a sum of 5 lakhs annually to irrigation. We trust that the resources of the country may be fully investigated, and that, if the results are sufficiently promising, it may be found possible to increase this allotment by a considerable amount. Some useful preliminary investigation has already been made into the capacities of the head-waters of the Sabarmati, Tapti, and one tributary of the Nerbudda; and these inquiries confirm the conclusion stated in the chapter on Bombay that the possibilities of the higher reaches of the principal rivers of Gujerat and the neighbouring States merit exhaustive and scientific investigation by Government, in co-operation with Baroda and the other States concerned.

706. The investigations made by His Highness's Government are limited, to a great extent, by the desire to find sites in or as close as possible to Baroda territory, and to prepare projects which will secure the maximum of benefit to that territory without consideration of the requirements of British territory or of other States. We have already recommended (paragraph 127) that an examination should be made by British and State Engineers working in conjunction, with the object of utilizing the waters of the rivers so as to secure the maximum benefit to the country at large, with little or no reference to territorial considerations excepting in so far as they may affect the expense of the resulting irrigation to the territory benefited. As in British Gujerat, the first object of the works will be rice irrigation; the secondary object *rabi* irrigation requiring storage sufficient to provide water far on into the cold or hot weather. It is possible that schemes may be found to serve the first object without storage and at comparatively slight expense. Great caution should be exercised in approving schemes for the second object alone. The preference will be given to schemes avoiding black soils. Such schemes are most likely to be found in the head-waters of the Sabarmati and Mahi situated in the Kadi and northern half of the Baroda Divisions of His Highness's territories. As regards the Nerbudda, it is impossible to say what can be done until the country has been prospected. But the hope of making effective use of the waters of this river has not been heightened by the information which the Durbar has given us. It seems only too probable that levels are unfavourable, and that it will be impossible to secure command of country in which irrigation will be of use. What is required is a project for giving an assured supply, not to the black cotton soils, which are probably less difficult to command, but to the *gorat* and mixed soils, in which rice is at present irrigated from tanks, wherever these can be made.

707. During the last twelve years the Durbar has granted, for the construction of wells, *takavi* advances aggregating 12 lakhs of rupees, of which about 7½ lakhs were given in the famine years 1899 to 1902. Nearly half of this sum was allotted to the Kadi Division. During the famine, as in British territory, the ordinary precautions as regards security were considerably relaxed, and interest was foregone, or largely lowered, periods of repayment were lengthened, and other special concessions were allowed. In ordinary years advances are given on two systems. Under one, known as the "old" system, no interest is taken on advances up to Rs. 500, only 3 per cent. on advances between Rs. 500 and Rs. 2,000, and on sums above that 6½ per cent.; sums up to Rs. 50 are made recoverable in two annual instalments, those between Rs. 50 and Rs. 500 in five,

and larger sums in ten instalments. More recently in some parts of the State the cultivator has been allowed the option of taking loans on the Madras system with long periods of repayment. We were not told which system the cultivator prefers. The State has also constructed a certain number of wells. The only figures given us are those quoted above for the Kadi Division. But the system of State construction seems to answer so well in Baroda that His Highness the Gaikwar proposes to extend it, if necessary, to all holdings which can be irrigated with advantage, and for which water is easily procurable at a moderate depth from the surface. It will be interesting and useful to observe the results of this policy, which is followed in other Native States, but the general adoption of which in British territory we are unable to recommend for reasons already given (I, 169). We trust, at any rate, that the policy of State construction will not induce His Highness to limit the sums given as *takavi* advances. Prior to the famine a tendency in this direction was observable, the sums advanced during the four years ending 1894-95 having averaged over Rs. 80,000, against Rs. 20,000 in each of the following five years. It is exceedingly probable that the State will have to rely for protection on wells more than on any other class of work.

708. We observed, with considerable satisfaction, a general disposition on the part of His Highness's Government to appreciate the usefulness of irrigation and the desirability of taking vigorous measures for its development on all lines which inquiry may show to be practicable; and we trust that this disposition will bear fruit in the provision of sorely needed protection from the effects of drought, to a substantial portion of His Highness's dominions.

SECTION VII.—CENTRAL INDIA.

709. The Native States comprised in the tract of country, known as Central India, occupy several very distinct regions, namely, Baghelkhand; Bundelkhand; part of the Gwalior State; Malwa, which includes a part of the large State of Indore, and several detached portions of Gwalior; and, lastly, the hilly regions south and south-west of Malwa, and small portions of the Nerbudda valley, south of these hills.

BAGHELKHAND.

710. *Physical features.*—The Baghelkhand States, of which the principal is Rewa, occupy a triangle the base of which consists of low hills which stretch from east to west, and form the northern boundary of the States, dividing them from the districts of Banda, Allahabad, and Mirzapur of the United Provinces. The southern two-thirds of the triangle, down to the apex, consist of hilly and broken country, much like the Mandla district of the Central Provinces and the more jungly portions of Chota Nagpur on the south-east. The remainder or northern portion of the triangle is a well watered and open country, containing considerable areas of black soil (*már*). There are also other soils similar in character and designation to the lighter and mixed soils of the Bundelkhand districts of the United Provinces, and no doubt equally well suited to irrigation.

711. *Irrigated areas and scope for their extension.*—The area of the Baghelkhand States is about 14,000 square miles, of which nearly 13,000 are in Rewa, to which belongs the southern forest and hill tract mentioned above. In this tract there is very little cultivation and irrigation, and the population is backward and sparse. The only useful irrigation works for such a tract are likely to be small works for the protection of rice cultivation round the village. The important river Sone rises here, but it does not emerge from the hills until long after it has left the boundary of the State. Any examination which may be made of this river for storage purposes is not, therefore, likely to extend into this tract. In the open northern tract of country the returns furnished to us show an irrigated area amounting in 1899-1900 to about 13,700 acres, of which 4,200 was from wells and 7,600 from "other sources," that is to say, presumably, small river-channels or *pains*. In the year 1900-01, the area under this latter class of

irrigation had increased by 40,000 acres. We have not been informed how this increase, most of which took place in the small State of Mailur, has been brought about. But we observe that this State has spent Rs. 3,25,00 on its irrigation works and advanced Rs. 58,000 in *takavi* as compared with Rs. 94,000 and Rs. 1,400 in the far larger State of Rewa. We trust that this extension of the irrigated area indicates a good return for the money spent or advanced by the Durbar. There can be no doubt that, except in the deep black soil, the whole of the northern open parts of these States presents opportunities for irrigation. Apparently there is much undulating country which, for want of terracing and embankment, has gone out of cultivation. We understand that, in the famine of 1896-97, a considerable amount was spent on this class of work, as well as a certain amount on tanks and dams for irrigation purposes. If the possibilities of the open parts of Baghelkhand were examined by a competent engineer, he would probably be able to discover considerable scope for small works. The upper waters of the river Tons also lie in Rewa, and the country should be examined with the object of ascertaining whether any use could be made of them, either in the State itself or in connection with the project. (which we have referred to in our chapter on the United Provinces) for irrigation from this river in the southern portion of the Allahabad district.

BUNDELKHAND.

712. *Physical and agricultural conditions.*—Included in the tract of Bundelkhand are twenty-two small States, covering an area of 9,800 square miles, with a population of about 1,275,000, or 130 to the square mile. The rainfall in most of these States averages between 30 and 40 inches, and though subject to considerable fluctuations, it is generally sufficient to fill the tanks and wells. But it is probable that the cold-weather discharge of the rivers would seldom be sufficient for irrigation on any large scale without storage. The physical and geological formation are generally favourable for irrigation. The southern boundary of the States consists of a considerable range of hills, known as the Bander, rising out of a plateau about 1,700 feet above the sea. About 15 miles to the north-west is the Panna range of hills, below which lies the main portion of the States, a plain country much broken by hills and spurs, especially towards the west and south-west. In these States also are included considerable lengths of the rivers Ken, Dassan, and Betwa. The last named river has already been utilized, and there are projects for utilizing the other two in British territory. The soils are the same as those of British Bundelkhand; namely, *már*, or black soil; and red soil (disintegrated sandstone). Pure *már* is unsuited to irrigation, but the proportion of this variety is said to be not very large. The red soil, except when accumulated in bottoms or behind embankments, is frequently too poor for irrigation; but the mixed soils, on the other hand, are every way suited to it, and the undulating surface of the country and numerous small drainages and streams offer good facilities for terracing and embankments. Although rock is not far from the surface, wells seem to be easy to make, and are inexpensive and durable. They are usually made by digging through the surface soil and blasting out a portion of the rock, to serve as a reservoir for the water and afford material for a rough masonry superstructure, which is often limited as in British Bundelkhand to the staging required for the lifting gear.

713. *Cropped and irrigated areas.*—Excluding the State of Panna, for which no information is available, the area of these States under crop in a normal year is returned at 1,519,000 acres, or about $1\frac{1}{2}$ acres per head of population; and of this 218,000 acres, or 17 per cent., are returned as irrigated, almost entirely from tanks and wells. The tank irrigation is, however, almost wholly confined to the single State of Orchha. In this State about 130,000 acres are irrigated from private and State tanks, but the total area irrigated by these means in all the remaining States does not exceed 10,000 acres. Out of the 41,000 wells, which are used in all the States for irrigation purposes, no less than 17,000 are in Orchha and they probably irrigate at least 50,000 acres. In this State itself the irrigated area is about 39 per cent. of its normal sown area.

714. *Captain Ewbank's projects.*—The States are all liable to famine, and in 1896-97 they suffered in much the same way and to the same extent as the adjoining portions of British territory. At that time advantage was taken to examine the ground for the purpose of devising relief works useful for protective purposes. A British Engineer Officer, Captain Ewbank, was employed on this duty and drew up a number of projects for small works, in Orchha and other States, such as tanks and field embankments, which were estimated to cost, in the aggregate, about four lakhs, and to protect 18,000 acres. The estimated cost of these works is under Rs. 22 per acre, and if the outlay and areas have been correctly estimated, this rate is so moderate as to afford a fair prospect of a remunerative return. The Political Agent, however, seems to be of opinion that Captain Ewbank's estimates were rather sanguine; and the Durbars, except those of States temporarily under Government administration, seem disinclined to take up the projects, either as ordinary works or for the employment of relief labour. The proportion of masonry required for many of these works certainly diminishes their value for relief purposes. Small works of this kind may, however, be very useful in seasons of badly distributed rainfall, even if of little value in a year of severe and prolonged drought. That a considerable amount can be achieved, without any direct loss and with possible profit to the State, seems to be shown by what has been accomplished in the State of Orchha, the ruler of which takes great interest in irrigation and has spent considerable sums in the restoration of old and the construction of new tanks and embankments.

715. *Tank repairs.*—Of even greater importance than the construction of new works would appear to be the restoration, repair, and improvement of existing tanks; of which there are at least one hundred and fifty, but all more or less inefficient owing to the neglect of essential works of maintenance and repair. The examination of these and other existing works would probably show that the areas irrigated from them are capable of considerable extension.

716. *Field embankments.*—During the famine we understand that relief labour was largely employed on field embankments, generally in the form of *bāndhs*, that is to say, earthen dams thrown across the streams and small drainages with the chief object of checking erosion, accumulating soil and silt, and holding up water behind the *bāndhs*, and, finally, of cultivating in the submerged area after the water had been let out. It is also anticipated that, in some instances, irrigation will be given to the lands immediately below the *bāndhs*; and it is believed that the holding up of water will raise the level of the subsoil supply, and render the construction of wells in the vicinity easier and more profitable. We understand that in a considerable number of instances these works have proved useful; and the Political Agent considers that small *bāndhs* are the form of work best suited to the country and the resources of the smaller States, where, in his opinion, the need of encouragement and assistance is most urgent.

717. *Wells.*—It is evident that in several of the States conditions are favourable also to the construction of wells. Apparently substantial sums are advanced in some of the States for this purpose, and many of the Durbars consider that wells are the best form of protective work for their States.

718. *Recommendations.*—Our general conclusion is that, with sufficient funds and proper investigation and management, the possibilities of irrigation in the Bundelkhand States admit of considerable development. In the first place, the head-waters of the larger rivers, the Betwa, Ken, and Dassan, ought to be surveyed with the object of determining whether any large storage project could be carried out with advantage to any or all of the States, as well as to the portions of British Bundelkhand which are traversed by the lower reaches of the rivers in question. In the next place, the existing tanks should be examined with the view of deciding what measures, if any, should be taken for their restoration, repair, or improvement. At the same time the country should be surveyed with the object of selecting sites for additional storage works, suitable either as ordinary works or for relief purposes, and for the smaller *bāndhs*, which may be entered in the programmes of relief works.

719. A great deal may also be effected by a policy of liberal advances to land-holders and tenants for the construction of irrigational works of improvement, including wells, *bándhs*, and embankments of all kinds.

720. A single well-qualified Executive Engineer, with subordinate staff and establishment, would probably suffice for the supervision of the preliminary investigations and executive work in all the States. It has been suggested to us that no special measure of assistance or encouragement is required for the Orchha State, where the Maharaja has shown so much discernment and energy in the development of irrigation works. We should deprecate any measure which would check the initiative of the Maharaja, but we have no doubt that His Highness will himself often be glad to receive professional advice and assistance in connection with important existing or proposed works within his territory.

GWALIOR.

721. *Physical features.*—The State of Gwalior, the largest and most important of the States of Central India, has a total area of 29,047 square miles and a population of 2,933,001 or of 101 to the square mile. It consists of three divisions—Gwalior, Isagarh, and Malwa. The first two form a compact but irregular oblong, and are bounded on the north by the British districts of Agra and Etawah, on the east by British Bundelkhand and the Saugor district of the Central Provinces, on the south by the State of Bhopal, and on the west by some of the Rajputana States. The south-west corner of Isagarh Division forms part of the Malwa plateau, and the north-east corner of Gwalior Division is a low-lying open plain, about 3,400 square miles in area, in physical characteristics not unlike the adjacent parts of the districts of Jalaun and Jhansi. The Indian Midland branch of the Great Indian Peninsula Railway forms the eastern boundary of this open country. West of this the land rises rapidly and the country becomes undulating and broken, till a confused mass of hills, plateaux, small valleys, and ravines is reached, which occupies most of the central and western portions of these two divisions. On both banks of the Chambal also the country is cut up into a labyrinth of innumerable precipitous ravines, the character and appearance of which can hardly be realized until actually seen.

722. *Gwalior and Isagarh Divisions.*—The two principal rivers are the Chambal and the Sind, both tributaries of the Jumna; the former pursuing a curvilinear course skirts the northern and western boundaries; and the latter flows in a north-easterly direction, first through the hilly and then through the open country, joining the Jumna two or three miles below its junction with the Chambal. Both these rivers have numerous small tributaries. The total cultivated area of the Gwalior and Isagarh Divisions amounts to 2,311,404 acres, or 1.1 acre per head of population. The two divisions together contain about an equal area of cultivable but uncultivated land. The Isagarh Division also contains large areas of forest. The present tendency of the land-holders seems to be to utilize the forest and waste land for grazing purposes and the rearing of cattle, rather than to extend cultivation. Throughout this part of the States, but especially in the Isagarh Division, where the population is only 90 to the square mile, there is evidently considerable difficulty in getting labour on to the land. From the accounts given by Fry and other travellers, and from the numerous oil and sugar mills made of stone, which are found scattered all over the country, or grouped in different localities, it is believed that in former years cultivation was far more advanced than at present. There are also numerous remains of ancient irrigation works, principally dams, earthen or masonry, which are now ruined and neglected. The comparatively backward state of the country is probably due to its having been the scene of constant warfare by the ravages of the Pindaris. It has also been suggested that the failure to maintain the dams and irrigation works in this part has resulted in increased aridity and in erosion of the valuable surface soil.

723. The exact proportion of the cultivated area, which is irrigated from all sources, is not easy to estimate. In the following table we give the figures supplied by the Durbar for the year ending June 1902 :—

| | Gwalior. | Isagarh. | Total. |
|--|----------|----------|---------|
| | No. | No. | No. |
| Total number of <i>pacca</i> wells | 9,808 | 12,555 | 22,363 |
| Total number of <i>kachcha</i> wells | 5,506 | 7,041 | 12,547 |
| Total number of tanks or <i>bands</i> holding water | 1,439 | 431 | 1,870 |
| Total number of tanks and <i>bands</i> out of repair | 146 | 370 | 516 |
| | Acres. | Acres. | Acres. |
| Areas irrigated by <i>pacca</i> wells | 30,539 | 42,926 | 73,065 |
| Areas irrigated by <i>kachcha</i> wells | 8,971 | 17,536 | 26,507 |
| Areas irrigated by tanks | 40,507 | 15,776 | 56,283 |
| Areas irrigated by flood spills | 10,375 | 1,769 | 12,144 |
| Total area | 90,392 | 78,007 | 168,399 |

According to this return the total area irrigated amounts to 168,399 acres, or over 7 per cent. of the cultivated area.

724. It will be observed that tank irrigation (including cultivation in the water-spread) accounts for 45 per cent. of the total in Gwalior, and only 20 per cent. in Isagarh, where there is a decided preponderance of well-irrigation. The figures, while indicating the existence of very material resources in the way of irrigation, are also suggestive of the policy to be pursued in this portion of the State. Its first object would appear to be the restoration and improvement of the existing works, then the extension of irrigation by means of new works and the embankment, terracing, and levelling of the extensive, irregular, and undulating tracts which are found throughout the State. Judicious measures of the kind would eventually result in a steady increase of the population, and a substantial development both of the revenues of the State and of the considerable agricultural resources which the country enjoys.

725. The Gwalior and Isagarh Divisions felt with full force the effects of the famine of 1896-97. Advantage was taken of the demand for employment to make a considerable beginning in the development of the policy which we have indicated, and a large number of projects were investigated, many of which were put in hand and completed. Most of these were small works, some of them masonry storage dams, others earthen dams for the same purpose, or for the purpose of preventing erosion and causing a deposit of soil and silt in the area of the water-spread. The total number of such works amounted to 353, and their cost to nearly three lakhs of rupees. The policy was steadily maintained until the end of 1900, when scarcity again occurred in the divisions of Gwalior and Isagarh. The total number of works executed up to the date of our visit to Gwalior amounted to 894 and the expenditure on them to nearly 16½ lakhs of rupees. These figures are for the whole State, but we understand that the greater part of the expenditure was incurred in these two divisions.

726. We have no details of the areas irrigated, and revenue obtained, as compared with the cost of these works. But the following are instances of success attained. At Bahadarpur, on the Morar, a tributary of the Chambal,

a masonry dam has been constructed at a cost of Rs. 34,500, protecting 500 acres of rice, but additional works have been proposed to bring another 1,000 acres under command. We inspected this work and consider that, with additions and improvements which have been proposed, it should prove both useful and remunerative. We also saw several instances of success in the 'bundling' up of *nalas* on the catchment of the same stream, whereby considerable areas have been reclaimed from jungle. In one instance, cited by Colonel Pitcher, the result of this reclamation, costing Rs. 3,000, has been the creation of a new village paying a revenue of Rs. 300 per annum. Two instances of the successful employment of famine labour on irrigation work are given by the same officer: the Dobini tank which cost Rs. 50,000 and supplies irrigation to 1,000 acres; and the Tonga tank which cost Rs. 42,000 and supplies water to about 1,000 acres. When the waste weir, which was breached by a flood in 1902, is properly repaired and the channels are extended, the Tonga tank is expected to irrigate 2,500 acres. There were other works which we saw in the neighbourhood of Gwalior in which the 'bundling' up of drainage areas and depressions, and the flooding of the land behind the *bāndhs*, appeared to have resulted in the partial reclamation of considerable areas, formerly barren from salt efflorescence.

727. Besides the works mentioned above, we were shown a partially completed masonry dam at Tikampur. The site had been well chosen, and a considerable area of fertile land, suitable for irrigation, was commanded by it. Owing, however, to serious defects in construction, the dam did not hold water. We were able, after examination of the plans, to suggest how these defects could be rectified, but the necessary measures will add considerably to the cost. The work is of such a character that operations should not be resumed until they can be carried out under the constant and close supervision of an expert irrigation officer.

728. There appears to be great scope for the extension of irrigation in these two divisions. As far as we could ascertain, there is a fair demand at all times for water from existing storage works, all of which appear to have been effective during the recent droughts. The largest areas irrigated from the Tonga tank were in the driest years, and in no case has the failure of a work been attributed to any deficiency in the supply. It is probable, therefore, that many new works may be proposed which are likely to prove directly remunerative. But direct remunerativeness is not the only object to be sought. One result of the policy followed during recent famines of finding employment for the people on works, many of which cannot prove directly remunerative, has been to keep the people on the land; so that at the census of 1901 the population in these two divisions showed an appreciable increase, in contrast to the decrease which occurred in the Malwa Division. The Durbar has already prepared for these two divisions a very complete programme of famine works, all of which are expected to prove useful as irrigation works. There are 840 works already in the programme, for 149 of which plans and estimates have been prepared by the Divisional Engineer. The remainder are under investigation. It is estimated that the works for which estimates have been prepared, will irrigate about 43,500 acres. If these programmes are completed, they will probably represent all that can be done in the way of small irrigation works for many years to come. All of the works are small, only one of them costing as much as two lakhs of rupees.

729. It is understood that the works in these programmes will be reserved as a means of employing distressed labour during famine. They are all admirably adapted for this purpose; but we hope that, if funds are available, it may be possible to carry out some of the larger and more promising of them in the ordinary way. We think that sites could also be found for works of more considerable size if the country were examined by an experienced irrigation officer with a trained subordinate staff, and that much might be done for the better protection of these two divisions if funds could be allotted for the systematic prosecution of a programme of such work. We are afraid that there is little prospect of being able to utilize the water in the river Chambal owing to the depth of its bed below the surrounding country; and we are informed that a project which has been framed for a work on the Sind river, to cost as much as

10 lakhs, has been set aside as it was not considered satisfactory. We think, however, that as soon as competent advice can be obtained, the possibilities of constructing irrigation works on this river should be more thoroughly investigated.

730. *Wells*.—From the table in paragraph 723 above, it will be seen that about 100,000 acres in these two divisions are irrigated from wells, of which 12,547 are classed as temporary and 22,363 as permanent. Thus over 4 per cent. of the cultivated area is under this class of irrigation. Of the permanent wells, an unspecified number are semi-permanent. A considerable number of wells has been sunk by the State not only for irrigation, but for drinking purposes, and with the object of starting new hamlets, and thus encouraging a higher class of cultivation in outlying tracts. There is no lack of soil suitable for well-irrigation, and in many places water lies within easy reach of the surface, and the construction of a well involves no special difficulties or expense. The cattle, however, are small and weak, and the area irrigated from each well is consequently small. The State has advanced money liberally for the construction of wells during the last 6 years. Interest is charged at 4 per cent. during the first year of the currency of one settlement is assessed at dry rates up to the end of the next. There is great room for the extension of well-irrigation, which will be best encouraged by a continuance of the present liberal policy in regard to loans.

731. *Other private works*.—No details have been furnished us showing the number of privately-owned tanks and *bándhs*. But that there are some of these is apparent from the fact mentioned by Colonel Pitcher, that a *jagirdar* had recently constructed a *bándh* at a cost of Rs. 15,000, and that, notwithstanding injury from a heavy flood, it had paid him a fair percentage on the outlay. No doubt the State is ready to encourage the execution of this class of improvement, such as tanks, dams, and field embankments, by means of liberal advances on the same lines as for wells. But in their present condition the resources of the ordinary landowners are probably insufficient for the multiplication of works of this description.

732. *Famine programmes*.—We have already referred to the excellent programmes of famine works which have been prepared for these two divisions, the majority of the works consisting of small tanks and *bándhs*—the most useful class of village works. The works are enumerated for each pargana or sub-division, and the following particulars are shown on the programmes:—

- (1) Whether plans and estimates have been prepared.
- (2) The name of the officer who has suggested the work.
- (3) The catchment area.
- (4) Estimated capacity of tank.
- (5) Minimum quantity of water likely to be available in a season of drought.
- (6) Area commanded by the project.
- (7) Area likely to be irrigated in ordinary years.
- (8) Area likely to be irrigated in a year of drought.
- (9) Data of rainfall, run-off, and duty on which the irrigated areas are estimated.
- (10) Return, if any, expected on capital cost.
- (11) Approximate cost.
- (12) Extent to which work can be carried out by famine labour, and other essential particulars.

This record is one which might, in many respects, form a model for British districts. It lacks a column showing the number of people for whom employment could be provided on each work, although the information can generally be derived from the entries in column 12.

733. *Malwa Division*.—The Malwa Division of this State consists, as has been already stated, of several detached portions of territory situated in the plateau of that name. The two districts of Agar and Shahjehanpur (Shajapur), which are the most easterly, lie in north-west of Bhopal. Agar is hilly, and Shahjehanpur more or less open country. This tract contains the head-waters of the Kali Sind, a tributary of the Chambal, which flows almost due north and joins that river in the Kotah State of Rajputana. The general elevation of the country is about 1,400 feet above sea level. The district of Ujjain is a little further west in the centre of the upper portion of the plateau, at an elevation of 1,700 feet, and is a well-known centre of the opium trade. The country to the north of the principal town is broken and undulating, and the rest is a black soil plain. To the south-west is the district of Amjhera, an extremely broken and hilly tract. On the north-west lies the open district of Mandasaur, and to the north of this again Nimach, which adjoins the State of Udaipur, and the southern portion of which is open country, with occasional hills, the northern being broken and hilly. The Chambal river in its higher reaches flows northwards through Ujjain, and forms the eastern and south-eastern boundaries of Mandasaur and Nimach. The total area of the division is 7,751 square miles, and the population only 111 to the square mile. Not much more than a half of the total area is cultivable; and of this, again, not much more than a moiety is actually cultivated, the remainder being cultivable waste. The division was severely affected by the famine of 1899-1900, when the rainfall fell from between 30 and 40 to from 15 to 6 inches. Large areas went out of cultivation, and at the census of 1901 the population was found to have diminished by 20 per cent.

734. The total area irrigated amounts to 63,600 acres, or about 5 per cent. of the cultivated area. Of this 4,600 acres are irrigated from tanks, and almost the whole of the remainder, that is, about 59,000 acres, from wells and water-lifts in the banks of streams. A great deal of the water is used for the irrigation of the poppy crop. A large proportion of the soil is of the black cotton variety, but much of it is evidently well-drained and of moderate depth, and accordingly not ill-suited to irrigation. The tank irrigation is conducted from 444 small tanks and ponds, and there are 95 others specified in the returns as out of repair and not holding water. Much of the so-called irrigation consists of cultivation in the tank water-spread; judging from the list of proposed works in the famine programme and from the character of the country, there are a good many sites for additional works of the kind. The policy of promoting irrigation has, however, been less highly developed in this division than in the other two. Across a tributary of the Chambal at Singoli, in the extreme north of the Nimach district, a permanent dam has been constructed, from which, if a canal were made, a substantial area might be irrigated. At present irrigation is carried on by lift from the banks. The numerous streams present great facilities for the construction of temporary dams, which could be utilized with great advantage for the storage of water in years of short rainfall. The division as a whole, there can be little doubt, has valuable possibilities for the development of tank irrigation, and the country ought to be fully examined with the object of discovering projects for the extension of irrigation. Severely, however, as it suffered in 1899-1900, the division is not so liable to drought as the two north-eastern divisions, and until recently it has been considered immune.

735. The programme of famine irrigation works is, however, slighter than in Gwalior and Isagarh, and to make it complete it should be placed in charge of a special Irrigation Officer. By careful prospecting of the country it should be comparatively easy to prepare a programme of irrigation works and field embankments, sufficient to provide employment for the great bulk of the population who are likely to require work in a severe famine.

736. The area irrigated from wells and water-lifts is undoubtedly capable of considerable extension, which should be encouraged with the same liberality as His Highness the Maharaja has extended to other portions of his territory.

737. In conclusion we have the pleasure of observing that His Highness takes an altogether exceptional interest in irrigation. He has toured through

parts of the country, examining and selecting sites for works, and ascertaining the circumstances and requirements of the people. There is no Native State in India in which there is a more favourable chance of excellent opportunities for irrigation being turned to full advantage by the intelligence of its ruler, who, up to the present, has set a valuable example in this matter to the Chiefs of Central India.

INDORE AND OTHER STATES.

738. *General conditions.*—The remaining States of Central India, comprising the large State of Indore, which forms the dominions of the Maharaja Holkar, 9,500 square miles in area, and a number of smaller States, occupy a total area of 27,000 square miles in the south-western corner of the province. The total population amounts to 2½ millions, or about 93 to the square mile. The hilly portions of the Vindhya and Satpuras, in which lies nearly half the area of this tract, are inhabited mostly by a backward and extremely sparse population of Bhils and kindred aboriginal tribes. Cultivation is also exceedingly scanty except in the open parts of the Malwa plateau. In Indore not more than half, and in the other States a far smaller proportion, generally not exceeding one-fourth of the total area, is under cultivation. The tract lies almost entirely within the area of the trap formation, black cotton soil being found in the open country of the Malwa plateau and Nerhudda valley. In and adjoining the hilly country are lighter and well-drained soils frequently well-suited to irrigation, the backwardness of which must be attributed largely to the sparseness and primitiveness of the people. The whole of this country was severely affected by the famine of 1899-1900. The Indore State was found in 1901 to have lost 22 per cent. of its population, and the minor States, especially those in the hills, were found to have suffered still more severely. But the greater part of the country escaped easily in 1896-97, and there can be no doubt that it seldom suffers from acute famine.

739. *Irrigated area and scope for its extension.*—Excluding the State of Bhopal and a few very small States, for which no information is available, an area of 2½ million acres is under crop in a normal year. Of this only 110,000 acres are irrigated, chiefly from wells. At the same time, according to the figures given to us, these States have expended no less than 40 lakhs on irrigation works, of which 27½ lakhs were spent in Indore. The greater part of this has probably been spent on famine relief works. How much of this expenditure has proved of real value for irrigation purposes we have no means of stating. But we gather from the statements of the Durbar Officers of Indore and many other States that there are numerous tanks and *bāndhs* out of repair, which, if restored, could be made useful for irrigation purposes, and that in most States there is considerable room for the extension of well-irrigation. There is no information as to the possibility of executing any large project. But, as suggested in paragraph 724 above, the headwaters of the Chambal may repay examination; and we think there can be no doubt that a systematic survey of the country would demonstrate the feasibility of executing numerous small works, such as tanks, *bāndhs*, and field embankments. It may be doubted, however, whether, in such an extraordinarily severe drought as that of 1899-1900, when the rainfall in many places fell to less than a half and even to one-sixth of the normal, the works would hold water unless designed to store more than a year's supply for the area intended to be protected by them. In the Bhil country operations would have to be very gradual and tentative until the people had shown by more settled habits that they were ready to appreciate the value of irrigation. In order that anything effectual may be done, in these as in other States, competent Engineer Officers for Irrigation are required. Two possibly would suffice: one for Indore, and one for the smaller States. These officers would investigate the possibilities of the various States and prepare a series of projects and a programme of famine relief works useful for irrigation.

GENERAL RECOMMENDATIONS.

740. Our recommendations for the States of Central India amount, then, to this: the appointment—for the examination of the country and for the preparation

of projects and relief-work programmes—of Irrigation Engineer Officers; one or more for each of the larger States, and one for each group of minor States. We would also recommend that these officers should work under the supervision of a Superintending or Consulting Engineer, who should be appointed for the whole Agency; and we think that, as in Rajputana, Government should be prepared to pay the Consulting Engineer and the Engineer for the smaller States. Effect should first be given to these recommendations in Northern Gwalior, Bundelkhand, and Baghelkhand, as being the tracts most liable to drought. But there would, we think, be no great objection to postponing active operations until the completion of the programme of protective works in Rajputana. The experience there gained should prove of great value in preparing the programme for Central India.

COLIN SCOTT-MONCRIEFF.

T. HIGHAM.

J. MUIR-MACKENZIE.

P. RAJARATNA MUDALIYAR.

Lucknow, April 11th, 1903.

- Kodo*.—An inferior millet (*Paspalum frumentaceum*).—Northern and Central India.
- Kudi-maramat*.—Repairs of irrigation works carried out by the cultivators.—Madras.
- Mahua*.—A fruit-bearing tree (*Bassia latifolia*).
- Malbáh*.—Village expenses.—Northern India.
- Málguzár*.—The person responsible to Government for the payment of the revenues assessed on a village.
- Már*.—Black cotton soil.—Central India and United Provinces.
- Mot*.—A large bucket for drawing water out of a well for purposes of irrigation.
- Mota*.—The hard stratum of soil met with in well-sinking.—Northern India.
- Muram*.—Disintegrated trap or other rock.
- Nála*.—A stream or ravine.
- Pain*.—A canal or water-course.—Bengal.
- Pakka*.—Ripe, complete; built of masonry.
- Pakota*.—A lever for raising water.
- Pancháyat*.—A native court of arbitration.
- Parwa*.—A yellow or red soil.—Bundelkhand.
- Rabi*.—The spring harvest or crop; the winter-spring season.
- Rági*.—A kind of grain (*Eleusine coracana*). The *marua* of Northern India.—Southern India.
- Ráyatwári*.—A term applied to tracts in which the revenue settlement is made by Government officers with each actual cultivator without the intervention of a third party.
- Reh*.—A saline efflorescence.
- Sowkár*.—A banker.
- Takávi*.—Advances of money made by Government to landowners or cultivators for the improvement of their land; or to poor cultivators to assist them in carrying on their cultivation.
- Tarái*.—Low moist land lying along the banks of rivers or at the foot of the Himalayas.
- Usar*.—Land infested with *reh* or saline efflorescence.
- Varágu*.—The common millet (*Panicum Miliaceum*).—Southern India.
- Zamindár*.—A landowner.
- Zamindári*.—A term applied to tract in which the land is held by zamindárs.